TERMS OF REFERENCE FOR CONSULTANTS

I. Background of the Proposed Project

A. Rational

1. Agriculture is central to Pakistan's economy and food security. The agriculture sector contributes 20% to the country's gross domestic product, employs 42% of its labor force, contributes 65% of export earnings, and provides livelihood to 62% of the rural population. Punjab is the country's largest province in terms of population and economy. Its population totals 110 million of which 65% are in the rural areas. The province covers nearly 73% of the national cropped area and 78% of the country's irrigated area. It contributes about 57% to the production value of the country's agriculture, which accounts for more than 26% of Punjab's gross domestic product, and employs over 40% of the provincial labor force. The province provides a large share of the country's main crops: maize (78%), wheat (77%), cotton (73%), sugarcane (63%), and rice (52%).

2. Punjab's agriculture growth rate has declined over the last 2 decades due to a number of challenges. These include the inadequate availability of high-yielding cultivars and lack of diversification in cultivation, inefficient on-farm water management, poor infrastructure for value chain development, weak research and extension services that are largely disconnected from market demands, and lack of advanced agriculture management supported by new technologies and innovations. In addition, some policy and regulatory issues such as an enormous public wheat procurement program, excess subsidies in production, a weak seed management system, and poor access by farmers to capital and financial resources have contributed to the sector's underperformance.

3. These challenges are further aggravated by, among others, the country's projected population growth rate, combined with improving living standards and lifestyle changes, especially in cities, and consequent changes in food demand in terms of quantity and quality; increasing competition for essential inputs such as land, labor, and water from other sectors in the economy; and increasing international competition for export commodities, especially for high value produce. All of these have resulted in the provincial agriculture growth not benefitting the rural poor in Punjab relative to its potential. This situation is further exacerbated by the country's exposure to projected climate change impacts.

4. The Punjab Agriculture Policy 2018, approved by the provincial government in November 2018, has identified a critical need for the rapid adoption of advanced technologies to revitalize the provinces' agriculture sector. Over the last decade, many types of advanced technologies for agriculture have been introduced and became available for use in the region.[1] These include high-efficiency irrigation systems, mechanized farming technologies, and farming and marketing management systems based on information and communication technology (ICT). The use of these technologies has demonstrated sound efficiency in farming activities in terms of productivity and profitability. In Punjab, such technologies have been introduced and piloted by large and progressive farmers. However, the use of these technologies by small farmers, representing more than 90% of the total farms in the province, is still very limited due to the lack of resources and opportunities for their access. This resulted in small farmers being continuously marginalized in the value chain economy, eventually contributing to the sector's underperformance.

[1] The World Bank. 2017. *Pakistan Development Update: Growth: A Shared Responsibility*. Washington DC. The countries in the region of Asia such as India, Thailand and China.

5. The Punjab Basmati Rice Value Chain knowledge and support technical assistance (TA) (the Basmati TA), financed by the Asian Development Bank (ADB) and implemented from 2014 to 2018, supported the small farmers' use of advanced technologies in their farming practices for basmati rice, which is a premium commodity for export.[2] The Basmati TA successfully demonstrated the technologies of direct-seeding for rice with laser land leveling, mechanized transplanting and combine harvesting to farmers. The demonstration activities were conducted by private service providers, with the technical support of public and private research centers in Punjab.[3] Knowledge of the demonstrated technologies and results were also successfully disseminated through an ICT tool to farmers and private service providers who participated in the TA activities.[4] The TA set the stage for ADB private sector support to the basmati rice producers. Based on the achievements of the Basmati TA, the Punjab Agriculture Department (PAD) further intends to support Punjab's small farmers in using and adopting advanced technologies with a focus on harvest, postharvest and marketing for three grain crops—rice, wheat, and maize—which are the main income source of many small farmers in Punjab, in engagement with a lot of private service providers and relevant industries in grain value chain, for which ADB's continued assistance is requested.

B. Proposed Solution

6. ADB's knowledge and support TA "Enhancing Technology-based Agriculture and Marketing in Rural Punjab" (the TA) will support the rapid adoption of advanced technologies to improve the productivity and profitability of the agriculture sector in Punjab, Pakistan. It will help increase farmers' access to advanced technologies in order to strengthen postharvest and marketing value chains in rural Punjab. It will also support increased institutional capacity to develop and adopt advanced technologies to benefit the agriculture sector.[5]

7. **Outputs, Methods, and Activities.** The TA will have four outputs: (i) Output 1: demonstration of advanced harvest and postharvest technologies conducted; (ii) Output 2: ICT-based direct marketing platform developed and installed; (iii) Output 3: capacity of stakeholders in developing and adopting advanced technologies increased; and (iv) Output 4: investment opportunities to scale up the adoption of technologies formulated. Outputs 1 and 2 will be delivered through the pilot testing and demonstration activities (refer to Attachment, Proposed Pilot Testing of Project Approach) where small farmers and private service providers will be invited to participate. TA testing and demonstration pilot sites will be in the areas where farmers produce the three major crops. The TA will incorporate public and private research centers' technical support for testing and demonstrating technologies through both on-farm and laboratory-based research and development activities. The outline of the four outputs are in paras. 8–11 below.

8. **Output 1: Demonstration of advanced harvest and postharvest technologies conducted.** The output will support small farmers in accessing advanced technologies for improved harvest and postharvest handling. Such technologies will be demonstrated to small farmers by private service providers. Good harvest and postharvest practices will improve the

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[2] ADB. Pakistan. Punjab Basmati Rice Value Chain; and ADB. 2019. *Technical Assistance Completion Report: Punjab Basmati Rice Value Chain.* Manila.

[3] ADB. 2018. *Punjab Basmati Rice Value Chain.* Consultant's report. Manila (TA 8578-PAK). More than 100 services providers participated in the TA demonstration activities.

[4] The TA published two knowledge products: Environment, Natural Resources, and Agriculture Division. 2018. Investment in Research and Development for Basmati Rice in Pakistan. *ADB Central and West Asia Working Paper Series.* Manila; and Development Asia. 2018. *A Case Study for Development Asia: Using Farm Mechanization to Strengthen the Rice Value Chain.* Manila.

[5] The TA is not included in the current country operations business plan for Pakistan 2019-2021. The TA Concept Paper was approved by ADB on 12 June 2019.

quality and quantity of select commodities by reducing their moisture content to prevent microorganism development and production of aflatoxins causing food safety hazards, thereby resulting in higher market prices. It will require timely and seamless handling for harvest, drying and storage of farmers' produce. Using mechanized technologies can largely help small farmers address such challenges.

9. **Output 2: ICT-based direct marketing platform developed and installed.** The output will support small farmers' participation in direct marketing—using web-based electronic platform supported by ICT.[6] It is a new marketing channel proposed by the PAD and approved by the provincial government in 2018. In Punjab, agriculture commodities are in principle brought to agriculture markets, the majority of which are regulated by the provincial government and auctioned there. Small farmers, however, have not benefitted from the current marketing practices due to the lack of transparency in auctioning, and the overwhelming presence and role of middlemen who control small farmers' marketing. The proposed farmers' direct marketing will address such issues by allowing farmers to sell their produce directly to any buyer outside of the existing agriculture markets.[7] It will give farmers an opportunity to sell their produce at better prices if innovative technologies such as ICT-based online trading application and its operating system are available for farmers to use and directly connect them to buyers.[8]

10. **Output 3: Capacity of stakeholders in developing and adopting advanced technologies increased.** The TA will assist in the capacity building of key stakeholders through workshops, seminars, and training programs to develop and adopt appropriate technologies for the achievements of outputs 1 and 2. The stakeholders include government agencies, farmers, private service providers and machine manufacturers, and researchers. Output 3 will also support international and national short training courses for the researchers and experts who will exclusively work for research and development on the rapid adoption of technologies for Punjab's agriculture value chain improvement. Such training courses will be held at or organized by the International Rice Research Institute, the International Food and Policy Research Institute, and/or other suitable international research centers. Various knowledge products to disseminate the results achieved under the TA will be developed and published for internal as well as external stakeholders.

11. **Output 4: Investment opportunities to scale up the adoption of technologies formulated**. The successful results of pilot testing carried in outputs 1 and 2 need to be scaled up through both public and private sector investments for further improved agriculture value chain with promising business opportunities for private entrepreneurs in Punjab. Output 4 will support the PAD in preparing short-, medium-, and long-term investment plan, and priority programs and/or projects concept notes. A socio-economic survey for baseline information of the TA pilot and demonstration component will be conducted under the TA. In addition, studies on sustainable agriculture management and improved value chain will be conducted to identify potential investment opportunities in the province's agriculture sector. The results of these survey and studies will be used to formulate an investment plan and design priority programs/projects' concepts.

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[6] A new direct marketing platform will be built, installed, and accessed through a website provided by any independent web service provider. The platform will be owned and managed by the TA during its implementation. Its ownership and administration will be handed over to the PAD at the end of the TA implementation.

[7] Government of Punjab. 2018. *The Punjab Agricultural Marketing Regulatory Authority Act 2018.* Lahore.

[8] There are many ICT-based agriculture information applications developed and operated in Pakistan. However, none of them are for farmers' direct marketing business as this innovative approach was very recently introduced by the Government of Punjab.

12. **Innovation, lessons and ADB's value addition.** The TA will promote innovative solutions to mainstream the use of advanced technologies to support the improved livelihood of small farmers in Punjab. To achieve its objectives, the TA will build upon the results and lessons from the Basmati TA which was successfully implemented to promote advanced technologies for Punjab's basmati rice value chain, and from other ADB-financed projects.[9] The TA will offer integrated solutions to address a mixed range of challenges through a "One ADB" operation for knowledge-sharing of innovation.

C. Proposed Cost and Financing

13. The TA is estimated to cost $2,750,000, of which $2,500,000 are expected to be financed on a grant basis by ADB's Technical Assistance Special Fund and an ADB-administered trust fund. The government will finance the balance in kind.

D. Implementation Arrangements

14. The TA implementation period will be 3 years (expected October 2019–September 2022). ADB, through the Environment, Natural Resources and Agriculture Division of the Central and West Asia Department, will administer the TA, and will select, supervise, and evaluate consultants. The PAD will be the executing agency for the TA. Its Agriculture Delivery Unit will be the focal in the PAD for TA implementation, with support from the relevant directorates of the PAD.

15. ADB will engage the consultants and carry out procurement following the ADB Procurement Policy (2017, as amended from time to time) and its associated project administration instructions and/or staff instructions. The TA will require 78 person-months of national consulting services through a firm consultant. In addition, the TA will separately recruit individual consultants with 24 person-months of international and 16 person-months of national consulting services.

16. **Procurement.** Goods and services required to implement the TA activities including pilot testing and demonstration will be procured by TA consultants using the provisional sum during the TA implementation. It is estimated that 14 packages amounted at $512,000 will be procured[10] through a request for quotation (shopping) method by consultants.

[9] ADB. Regional: Addressing the Pre- and Postharvest Challenges of the Rice Supply Chain; ADB. Regional: Improving Poor Farmers' Livelihood through Rice Information Technologies; and ADB. Regional: Improving Poor Famers' Livelihood through Post-Harvest Technologies.

[10] It is planned that two packages for goods estimated at $25,000 and 12 packages for services estimated at $487,000 will be procured through a request for quotation (RFQ) method. Of these packages, two packages for goods ($25,000) and 11 packages for services ($467,000) are planned to be procured by a TA firm consultant through RFQ.

II. The Consulting Service Assignment – Implementing the TA

E. Scope of Work

17. ADB will recruit a consulting firm to implement activities for the TA outputs. The firm will be responsible for the following tasks:

(i) review the description of planned pilot testing and demonstration activities in Pilot Testing of Project Approach (Attachment), and apply its details to execute the following (ii)–(xix) as appropriate;
(ii) assist the executing agency and ADB TA Team in assessing the current state of districts dominated by three major grain crops—rice (basmati and non-basmati/long grain), wheat and maize—and in selecting areas for pilot and demonstration activities;
(iii) review available information and data, and conduct the assessment of current state of harvest and postharvest (moisture control/drying and storage) activities for rice paddy, wheat and maize respectively, in the countries and elsewhere; and identify and recommend technologies which can be promoted through local service providers and/or local manufactures with respective advantages and disadvantages of each technology in terms of performance and cost-effectivity;
(iv) review available information and data, and assess the current state of relevant rural service industries for value chain such as machineries, transport, communications, and logistics all of which are critically important to optimize the benefits of technology-based agriculture and marketing activities for major grain value chain;
(v) develop methodologies to involve the abovementioned private sector stakeholders and work with them in the pilot testing and demonstration of activities in the selected pilot target areas;
(vi) review available information and data, and assess the current state of small farmers' marketing practices to sell their grain produce, identify major players in marketing, and confirm existing challenges or bottlenecks to small farmers in the selected pilot target areas;
(vii) install a web-based platform and application system for farmers' direct marketing that will be designed and developed by a TA consultant of individual consultant selection (ICS) package, and assist farmers in using the system to sell their produce at better prices;
(viii) conduct a consultation meeting with all concerned stakeholders including focus group discussions, identify gaps and challenges in their knowledge and practices in the areas of harvest, postharvest and farmers' direct marketing; prepare a plan of workshops, seminars and training to increase the stakeholders' awareness to and knowledge of good practices and advanced technologies to improve grain value chain in Punjab, Pakistan;
(ix) assess and confirm that the proposed pilot testing of project approach will have no potential adverse environmental and/or social impact resulted from activities;
(x) recommend technologies to be piloted and demonstrated in consultation with the executing agency and ADB TA Team, obtain their approval, and prepare the implementation plan and detailed schedule of proposed pilot project;
(xi) undertake pilot testing and demonstration activities, monitor their results, and incorporate lessons learned in the next season's activities for doing better to achieve envisaged output targets and outcome;
(xii) collect all relevant data and information of inputs and outputs in/from pilot testing and demonstration activities on selected technologies, analyze them, identify lessons from the activities, document these in consultants' reports of the implementation and results

of pilot project that will be prepared every crop season, and use them to prepare the PAD's investment priority for short-, medium-, and long-term investment plan;

(xiii) conduct workshops, seminars and training for farmers, private service providers and other stakeholders to learn used technologies and their benefits;

(xiv) design and conduct a household survey among farmers who will participate in the pilot project to collect baseline information for assessing and analyzing the results of activities (Stata statistical software will be used for analyzing survey data and the firm should be familiar with the use of Stata), and prepare economic and cost-benefit analysis of the pilot project with selected technologies;

(xv) review and analyze the current state of livelihood of the most vulnerable in rural communities such as tenant farmers and landless people, conduct an initial assessment of the impact of technology-based agriculture on such people, and identify possible measures to empower them during transition in the agriculture sector;

(xvi) review, assess and recommend investment needs to scale up the adoption and diffusion of the technologies that have been piloted and demonstrated in the proposed TA and also in other TAs or projects financed by the government of Punjab and development partners including ADB;

(xvii) based on the outcomes of the above tasks, prepare the government's short-, medium, and long-term investment plan to enhance technology-based agriculture and marketing for improved value chain, which includes the concept notes of at least 2-3 selected priority programs/projects for future investment including ADB financing, following ADB's operational requirements and procedures if and when required;

(xviii) guided by the executing agency and ADB TA Team, work closely with the public and private research and development (R&D) centers in Punjab, Pakistan whose support to pilot testing and demonstration under the TA is essential; and

(xix) undertake any other tasks jointly agreed by ADB TA Officer and the firm during the assignment.

18. The firm will also be responsible for the procurement of goods and works for pilot testing and demonstration activities, office equipment, organization of workshops, seminars and training for farmers and PAD extension staff, and engagement of a firm to conduct a farm household survey including the preparation of their terms of reference (TOR).

F. Key Expertise Required and Outline Terms of Reference

19. Key experts required, and their indicative person-months are in Table 1 below, while required inputs of the key experts will be proposed in the consultant's technical proposal. The assignment will be for 32 months, expected by December 2019 to July 2022. The outline of terms of reference for key experts are in para. 19- 26 below.

Table 1: Experts Required and Indicative Person-Months

	Position	Key or Non-Key	Experts required		Indicative inputs
			Source	Number	
1	Agricultural Economist / Team Leader	Key	National	1	17
2	Agriculture Value Chain Development Specialist	Key	National	1	8
3	Agriculture Specialist / Pilot Project Coordinator	Key	National	1	27
4	Environmental Safeguard Specialist	Key	National	1	6
5	Social Development and Safeguard Specialist	Key	National	1	7
6	Gender Specialist	Key	National	1	7
7	Procurement Specialist	Key	National	1	6
	TOTAL			**7**	**78**

20. **Agricultural Economist/Team Leader**. The specialist should have at least a master's degree in agriculture economics or related discipline, with at least 15 years of work experience in planning, implementing, monitoring and evaluating agriculture sector development, and/or agriculture value chain and agriculture study projects financed by key international development partners. The specialist should have an experience of leading a team of multidisciplinary consultants and will have up-to-date knowledge of agriculture sector transformation in Punjab, Pakistan. The specialist will:

(i) as Team Leader, provide overall supervision and coordination of activities to be carried out by the team's specialists to ensure the overall scope of work assigned to his or her team is fully accomplished;
(ii) supervise Procurement Specialist in procuring goods and works to implement the proposed pilot project;
(iii) supervise and monitor all subcontracted activities (a farmers' household survey, pilot-demonstration of technologies for farmers, various reach-out seminars and training for farmers) to ensure timely and quality deliveries;
(iv) supervise project accounting/payments for all pilot testing and demonstrating activities in accordance with ADB's TA disbursement handbook and ensure timely claim submissions;
(v) as Agricultural Economist, with the provision of technical advice and inputs of Economist, the international individual consultant recruited by the TA, lead in designing and preparing the TOR and the questionnaires for a farm household survey with the necessary inputs of Social Development and Safeguard Specialist, Gender Specialist and Environmental Safeguard Specialist;
(vi) prepare the inception report of farm household study (Deliverables iii) containing the proposed scope of studies, methods of data acquisition and data analysis, the survey questionnaires, the TOR of the survey firm which will be subcontracted, cost estimates, and survey implementation plan and schedules;
(vii) undertake a survey firm selection with the help of Procurement Specialist;
(viii) lead in supervising and monitoring survey implementation carried out by a selected survey firm, in close collaboration with Agriculture Specialist/Pilot Project Coordinator, Social Development and Safeguard Specialist, and Gender Specialist, and ensure the quality and timelines of deliverables prepared and submitted the survey firm;
(ix) analyze survey data using Stata statistical software, and prepare a report of farm household study (Deliverables iv) containing economic analysis and cost-benefit analysis of the interventions, which can be used for replicating and upscaling the pilot project in the future investment;
(x) provide initial economic analysis and cost-benefit analysis for the concept notes of potential programs/projects for future investment including ADB financing; and
(xi) provide technical inputs to relevant deliverables by the firm.

21. **Agriculture Value Chain Development Specialist**. The specialist should have at least a bachelor's degree in social sciences or related discipline, with at least 10 years of work experience in agriculture value chain business. The specialist should have the experience of executing and managing the planning and implementation of grain value chain projects at commercial basis including harvest, postharvest and marketing operations. The specialist should also have the knowledge of updated, feasible and marketable technologies and innovative practices for grain value chain. Experience in commodity standardizations linked to international requirements / protocol, will be a high advantage. The specialist will:

(i) With the provision of guidance and specific technical inputs on advanced technologies for harvest, postharvest and marketing by two international individual consultants recruited by the TA, Agriculture Value Chain Technology Development Specialist and Agriculture Commodity Market and Finance Specialist, conduct initial assessment on the current state of harvest, postharvest and marketing practices for paddy, maize and wheat in the pilot areas, identify technologies to be used, and prepare an implementation plan and schedule, in close collaboration with and having technical inputs from Agricultural Economist/Team Leader and the other consultants including international individual consultants;
(ii) With the provision of guidance and technical inputs by Agriculture Value Chain Technology Development Specialist and Agriculture Commodity Market and Finance Specialist, lead in preparing the description report(s) of selected technologies and applications for pilot testing and demonstration (Deliverables ii);
(iii) assist Procurement Specialist in preparing procurement documents by providing technical inputs and in procuring goods and works to implement proposed pilot testing and demonstration activities;
(iv) monitor and review the implementation and results of pilot project, in close collaboration with Agriculture Specialist/Pilot Project Coordinator in respect with the appropriateness of piloted and demonstrated technologies, assess and analyze results, provide findings and lessons learned to improve the following activities; and
(v) provide technical inputs to relevant deliverables by the consultant team.

22. **Agriculture Specialist/Pilot Project Coordinator**. The specialist should have at least a bachelor's degree, and preferably a master's degree in agronomy, agriculture engineering, or related discipline, with at least 7 years of work experience in the projects of agriculture value chain development and sector capacity development, including at least 1–2 projects financed by international development partners. The specialist should have sufficient R&D and field experience working with farmers and private sector stakeholders engaged in agriculture value chain. The experience of serving as a coordinator for agriculture field activities will be an advantage. The specialist will:

(i) lead the implementation of the proposed TA pilot project in a timely manner, coordinating all stakeholders participated in pilot testing and demonstration activities including workshops, seminars and training, in close collaboration with Team Leader and other consultants;
(ii) coordinate all consultation with farmers and other stakeholders in the field and ensure the TA pilot project's good engagement with concerned stakeholders throughout its implementation;
(iii) coordinate the timely monitoring and reviewing of the implementation and results of pilot project, and various activities for studies and surveys;
(iv) assist the Procurement Specialist in procuring goods and works to implement the pilot and demonstration activities in a timely manner; and
(v) provide technical inputs to relevant deliverables by the firm, especially to the periodic reports of the implementation and results of pilot project (Deliverables v).

23. **Environmental Safeguard Specialist.** The specialist should have at least a bachelor's degree, and preferably a master's degree in environmental science, natural resources management, or related discipline, with at least 10 years of work experience in the field of environmental management. The specialist should be familiar with ADB's Safeguard Policy Statement (SPS) (2009) and the country's up-to-date environmental safeguard regulations and requirements. The specialist will:

(i) conduct environmental safeguard due diligence on the pilot testing of selected technologies and prepare a rapid environmental assessment at TA inception stage before its activities starts, and ensure that no potential adverse environmental impacts resulted from the pilot activities, following ADB's SPS (2009);
(ii) monitor the activities of pilot project during the implementation and ensure that no potential adverse environmental impacts resulted from the pilot activities, following ADB's SPS (2009) throughout the implementation;
(iii) assist in preparing the questionnaire of a farm household survey and the report of farm household study by providing relevant technical inputs and analysis;
(iv) provide initial environmental assessment and review framework for the concept notes of potential programs/projects for future investment including ADB financing, in compliance with ADB's SPS (2009) if and when required, and the country's environmental requirements; and
(v) provide technical inputs to relevant deliverables by the firm.

24. **Social Development and Safeguard Specialist.** The specialist should have at least a bachelor's degree, preferably a master's degree in social sciences, development studies, or related discipline, with at least 10 years of work experience in social development and safeguards management including involuntary resettlement and indigenous peoples safeguards. The specialist should be familiar with ADB's Safeguard Policy Statement (SPS) (2009) and the country's up-to-date social safeguard regulations and requirements. The specialist will:

(i) conduct social safeguard due diligence on selected pilot testing of project approach at TA inception stage before its activities starts, and ensure that no potential adverse social impacts resulted from the pilot activities, following ADB's SPS (2009);
(ii) monitor the activities of pilot project during the implementation and ensure that no potential adverse social impacts resulted from the pilot activities, following ADB's SPS (2009) throughout the implementation;
(iii) lead in conducting focus group discussions and consultations with farmers and other stakeholders in the communities under the proposed pilot project areas;
(iv) assist in preparing the questionnaire of a farm household survey and the report of farm household study by providing relevant technical inputs and analysis;
(v) review and analyze the current state on livelihood of the most vulnerable in rural communities such as tenant farmers and landless people, and jointly prepare with Gender Specialist a report of study on technology-based agriculture and its impacts on the livelihood of the most vulnerable in rural communities in Punjab (Deliverables vi) covering initial assessment of the impact of technology-based agriculture on such peoples, and identify possible measures to empower them during transition in the agriculture sector;
(vi) provide initial social safeguard assessment and review framework for the concept notes of potential programs/projects for future investment including ADB financing, in compliance with ADB's SPS (2009) if and when required, and the country's social safeguard requirements; and
(vii) provide technical inputs to relevant deliverables by the firm.

25. **Gender Specialist.** The specialist should have at least a bachelor's degree, preferably a master's degree in a relevant social science discipline, with at least 10 years of work experience in social and gender development. The specialist should be familiar with ADB's policy on gender and development and related procedures, and the country's up-to-date policy and guidelines on gender and development, sufficient fieldwork and survey experience. The specialist will:

(i) lead in conducting focus group discussions, consultations and training activities with the female family members of farm households and other female stakeholders in the communities under the proposed pilot project areas;
(ii) assist in preparing the questionnaire of a farm household survey and the report of farm household study by providing relevant technical inputs and analysis;
(iii) review and analyze the current state on livelihood of the most vulnerable, especially women in rural communities such as tenant farmers and landless people, and jointly prepare with Social Development and Safeguard Specialist a report of study on technology-based agriculture and its impacts on the livelihood of the most vulnerable in rural communities in Punjab (Deliverables vi) covering initial assessment of the impact of technology-based agriculture on such peoples, and identify possible measures to empower them during transition in the agriculture sector;
(iv) conduct initial gender analysis and develop preliminary gender action plan for the concept notes of potential programs/projects for future investment including ADB financing, in compliance with ADB's gender and development policy and related procedures if and when required, and the country's up-to-date policy and guidelines on gender and development; and
(v) provide technical inputs to relevant deliverables by the firm.

26. **Procurement Specialist.** The specialist should have a bachelor's degree in relevant discipline, with at least 7 years of work experience in procurement including experience with projects financed by the governments and / or development partners. The specialist will:

(i) prepare the procurement documents, procure goods and works to implement TA activities including proposed pilot project following a TA procurement plan, procure them and undertake contract management as required;
(vi) conduct initial review and assessment on procurement management capacity of the PAD, analyze the results of review, prepare a report with proposed measures to mitigate procurement management risks for the concept notes of potential investment programs/projects including ADB financing, following ADB's Procurement Policy if and when required; and
(vii) provide technical inputs to relevant deliverables by the consultant team.

G. Deliverables

27. The firm will prepare and submit the following:

(i) **Inception report** including (a) the background analysis of challenges in harvest, postharvest and farmers' marketing of their produce; (b) the rapid analysis of stakeholders including farmers and other value chain actors such as private service providers of advanced machineries and innovative ICT technologies for agriculture value chain, machine manufacturers, grain processors, stakeholders of agriculture commodities trading including agriculture produce markets; (c) proposed technologies to be piloted and demonstrated to address the challenges, and the methods for selecting and engaging relevant stakeholders to implement testing and demonstration and cost estimates; (d) environmental safeguards due diligence including a rapid environmental assessment, social safeguards due diligence and others as required; (e) the needs assessment and planning of workshops, seminars and training programs for farmers and other rural-based stakeholders' capacity development; and (f) work plan and schedule of pilot testing demonstration activities;

(ii) **Description report(s) of selected technologies and applications for pilot testing and demonstration** covering detailed information including the specifications of selected technologies and the methodologies to apply and implement pilot testing and demonstration (including farmers' training activities) to farmers and private sector stakeholders; service providers, machine manufacturers, and grain commodity industries;

(iii) **Inception report of farm household study** containing the proposed scope of studies, methods of data acquisition and data analysis, the survey questionnaires, the terms of reference of the survey firm which will be subcontracted, cost estimates, and survey implementation plan and schedules;

(iv) **Report of farm household study** containing a farm household survey report with data analysis[11] including a survey implementation report, which at least covers the baseline information of farm household in the pilot areas, and economic analysis and cost-benefit analysis on the piloted interventions;

(v) **Periodic reports of the implementation and results of pilot project** including reviews on implementation and achievements, technical assessment on tested technologies, input/output data, cost-benefit analysis, issues and challenges in pilot project, and actions to be taken to address the issues in the subsequent batches of pilot activities;

(vi) **Report of study on technology-based agriculture and its impacts on the livelihood of the most vulnerable in rural communities in Punjab** covering any impact on the livelihood of tenant farmers and landless people in the province's rural communities by promoting technology-based agriculture, and identify issues and possible measures to address them, and to empower them during transition in the agriculture sector;

(vii) **Interim report** summarizing the results and achievements of the activities implemented for all four outputs to the interim time, issues identified, analysis made, and recommendations to address the issues in order to improve the subsequent batches of pilot testing and demonstration activities;

(viii) **Investment plans for short-, medium-, and long-term** containing review on the existing government's investment priorities and plans with estimated investment required; and assessment on the needs and impact of adopting technologies for value chain including technologies used in the TA at the basis of the results of the deliverables (i)–(vii) above and deliverables of the consultants under ICS packages, benefitting value chain enhancement that will support small farmers' higher farm income and increased rural business opportunities for the private sector entrepreneurs;

(ix) **Concept notes of potential investment programs/projects** including the rationale of investments, preliminary program/project design, initial economic and financial analysis, indicative budget required and financing plan, implementation arrangements, the assessment of classification and risk categorization, due diligence, technical assistance and other requirements for ADB financing for at least 2–3 potential investment cases; and

(x) **Final report** covering the final results and achievements in all four outputs including knowledge products prepared and published, analysis on them, findings, lessons learnt, and conclusion and recommendations to the ADB's future investment.

28. **Counterpart support.** The government will provide counterpart support in the form of staff, office accommodation, data and information access, secretarial assistance, domestic transportation for counterpart staff, and other in-kind contributions.

[11] Stata statistical software will be used.

PROPOSED PILOT TESTING OF PROJECT APPROACH

1. The objectives of the proposed pilot project under the technical assistance (TA) are: (i) conduct a demonstration of advanced harvest and postharvest technologies (output 1); and (ii) develop and install direct marketing platform that is based on information and communication technology (ICT) (output 2). The expected outputs will be (a) at least 2,000 farmers participated in pilot testing and demonstration activities; (b) at least three advanced technologies demonstrated and used by farmers; (c) ICT-based farmers' direct marketing platform developed; (d) at least 500 farmers participated in pilot activities; and (e) at least 10,000 tons of farmers' produce offered for sale through farmers' direct marketing.

2. **Proposed approach of pilot project.** The pilot project conducted under ADB's knowledge and support technical assistance TA 8578-PAK: Punjab Basmati Rice Value Chain[1] was successfully implemented and generated good results. It applied the following innovative approaches and methodologies: (i) engaging with private services providers to pilot and demonstrate new technologies for improved farming practices; (ii) establishing stakeholders' communication networks supported by ICT to scale up demonstration activities and inclusively reach out targeted farmers in the pilot areas; and (iii) collaborating with the public and private research centers that provided research and development (R&D) inputs such as calibration on machineries and timely advisory services for good production practices through pilot activities.[2] Similar approaches and methodologies will be applied to the proposed pilot project to achieve assured results.

3. A pilot project to be undertaken under the proposed TA should be replicable, scalable, sustainable, and benefit small farmers in rural Punjab. Activities under the pilot project should not result in any potential adverse and/or social impacts.

4. **The description of the scope of proposed pilot project** are as follows:

(i) Targeted produce: rice paddy, maize and wheat
(ii) Targeted areas in value chain: harvest, postharvest and marketing
(iii) Proposed pilot areas: Two or three pilot sites in rice-wheat cropping area in Hafizabad and Sheikhupura districts,[3] and one or two pilot sites in maize cropping area[4] in Okara and/or Pakpattan districts;[5] (exact sites for pilot testing and demonstration will be assessed and decided by the executing agency and ADB TA Team in support of TA consultants at the beginning of TA implementation)
(iv) Targeted farmers: At least 2,000 farmers, comprising 1,500 for rice-wheat cropping and 500 for maize cropping
(v) Targeted stakeholders to be involved (other than farmers): private sector's local service

[1] ADB. 2013. *Punjab Basmati Rice Value Chain*. Manila. The TA was implemented in January 2014–December 2018; and ADB. 2019. *Technical Assistance Completion Report: Punjab Basmati Rice Value Chain.* Manila.

[2] For the results and achievements of the TA 8578-PAK, refer to ADB. 2019. *Technical Assistance Completion Report: Punjab Basmati Rice Value Chain.* Manila; ADB. 2018. *Punjab Basmati Rice Value Chain.* Consultant's report. Manila (TA 8578-PAK); and the following two knowledge products published under the same TA: (i) Environment, Natural Resources, and Agriculture Division. 2018. Investment in Research and Development for Basmati Rice in Pakistan. *ADB Central and West Asia Working Paper Series.* Manila; and (ii) Development Asia. 2018. *A Case Study for Development Asia: Using Farm Mechanization to Strengthen the Rice Value Chain.* Manila.

[3] Hafizabad and Sheikhupura are two of the major rice-wheat growing districts in Punjab, especially famous to produce high-quality basmati rice.

[4] Maize has two cropping seasons in a year and the pilot project can intensively work in both.

[5] Okara and Pakpattan are two of the major maize growing districts in Punjab.

providers for advanced machineries, and transport and logistics, local machinery manufacturers, grain processors, traders

(vi) Pilot testing cycle: At least two seasons of technological interventions for each produce; rice paddy, maize and wheat to be tested and demonstrated respectively during the TA implementation period

5. Proposed technologies to be tested and demonstrated in the proposed pilot project. With experience and lessons learned from TA 8578-PAK, the following are recommended, but not limited to, key technologies to be tested and demonstrated in the proposed pilot project. Alternate technologies can be proposed by TA consultants to be assigned to the implementation of the pilot project.

(i) **Grain moisture control technologies (for rice paddy, maize and wheat)[6]:** Drying is the process that reduces moisture content to the level where it is safe for storage. High moisture level during storage can lead to grain discoloration, encourage development of molds, and increase the likelihood of attack from pests. It can also decrease the germination rate of seeds. To address these challenges, it is critically important to harvest at the right time with the right grain moisture content. Using mechanized postharvest technologies such as advanced grain combine harvesters can significantly reduce the time required for a complete harvest operation in one-go and help farmers in harvesting with the right grain moisture content. In addition, the combine harvester can reduce farmers' cost of harvesting and threshing by hired labor. Various types of imported grain combine harvesters are already available in the agriculture machinery market in the country, but small farmers' use of such technologies/machineries is still very limited. The benefits and efficiency of such selected technologies can be piloted and demonstrated to farmers through private service providers. After harvesting by advanced combine harvesters, farmers can still conduct a traditional and common practice of drying (i.e. sun-drying) for their own grain produce. For this, a portable and collapsible mat drying technology—which largely reduces contamination with dust,[7] avoid negative impacts of rainfall, and makes grain collection easy—is also now available locally in Punjab and can be tested and demonstrated through private service providers.[8]

(ii) **Hermetic storage technologies (for rice paddy, maize and wheat):** Good storage systems help in (a) protecting grain from insects, infestation, mold growth, oxidation, and rancidity; (b) preventing moisture from re-entering grain after drying; (c) ease of maintenance and management; (d) ease of loading and unloading; (e) efficient use of space. Hermetic storage or sealed storage can meet these requirements. It involves enclosing the grain in an air-tight container that minimizes gas exchange between the surrounding air and the inter-granular atmosphere inside the container, and may be used for insect control without pesticides resulting to high germination rates of grains/seeds. Some commercial hermetic storage products with different forms and sizes[9] have been introduced to the market and available in Pakistan, but the knowledge of hermetic storage

[6] Wheat does not need drying operation as it is harvested during dry season but promoting the use of advanced combine harvester to small farmers can contribute to their reducing labor costs and the time of harvest.

[7] Contamination with dust at this operation stage supports in developing funguses that lead to quality damage of grains.

[8] This simple and innovative drying technology can be demonstrated not only to farmers but also to processors of rice and maize as it helps optimize the benefits of piloting the technology. In Punjab, a common practice is that processors conduct mechanical drying after short sun-drying.

[9] Food and Agriculture Organization of the United Nation. 2013. *Review of the Wheat Sector and Grain Storage Issues in Pakistan*. Rome.

technologies among stakeholders in grain value chain is very limited. They can be piloted and demonstrated through private service providers to farmers, based on their needs.[10]

(iii) **ICT-based platform and application for farmers' direct marketing (for rice paddy and maize)**: Farmers' direct marketing is a new market channel approved by the Government of Punjab's Punjab Agricultural Marketing Regulatory Authority Act 2018.[11] An ICT-based platform to display farmers' offered prices to sell their produce and related information and an application to access this platform by users, will be designed, developed, installed, and tested by a local information technology developer and TA consultants. Farmers in the TA pilot sites will use the system to pilot and demonstrate the technology. At least 300 rice growing farmers and 200 maize growing farmers will be invited to participate in the proposed activities using the ICT based platform for farmers' direct marketing.[12] Pakistan Mercantile Exchange, Pakistan's sole commodity exchange, has developed an online trading system for agriculture commodities, where many international and national market stakeholders participate. For the purpose of farmers' use, a simpler application, where farmers can display information on their own produce available for sale and at the same time attract direct buyers, would be sufficient.

6. **Implementation arrangements.** TA pilot testing and demonstration activities will be implemented by a consulting firm with the support of international and national individual consultants selected under the proposed TA, in close supervision of the executing agency and ADB TA Team. Researchers in public research centers will provide their relevant technical inputs on agronomy, technologies, and machineries through workshops, seminars, training and ICT tools under the TA.[13] Two field offices will be established in TA pilot areas to coordinate timely activities and deliveries of the pilot project with farmers, service providers, machine manufacturers, grain processors, researchers, government officials, and other relevant stakeholders, to achieve the TA pilot projects' objectives and outputs.

7. Goods and services to support the implementation of the proposed pilot project is estimated at $500,000 and will be procured by TA consultants. In addition, $100,000 is estimated for relevant training activities for farmers and extension staff of the Punjab Agriculture Department (PAD). Technologies to be piloted and demonstrated during the proposed TA are expected to be procured as services, or leased as much as possible, to create and promote the business opportunities of private service providers.

8. The following including the assessment of associated risk categorization and required due diligence items have been confirmed and agreed by ADB TA Team and the PAD:[14]

[10] This technology can also be demonstrated to grain processors if it can optimize the benefits of piloting the technology. R&D on such mechanical drying for an industrial use is critically required for improved grain value chain in the province. The PAD intents to work with the University of Agriculture Faisalabad (UAF) and Agriculture Mechanization Research Institute (AMRI) on R&D for this subject, and the proposed TA will support building their capacity to undertake the assignment through providing workshop, seminars and training.

[11] Government of Punjab. 2018. *The Punjab Agricultural Marketing Regulatory Authority Act 2018*. Lahore.

[12] Rice is export commodity and maize is yet non-export commodity. The proposed pilot project intends to test with both commodities, however; a detailed plan will be finalized at the TA inception stage with TA consultant's assessment.

[13] Under TA 8578-PAK, researchers conducted compete calibration on farming machineries in the field and disseminated knowledge on new farming technologies and machineries used as well as good production practices supported by them to a group of farmers and services providers through WhatsApp.

[14] Pilot testing of project approach implemented by TA should follow relevant ADB project administration instructions and /or staff instructions.

(i) proposed pilot testing are (a) grain moisture control technologies, (b) hermetic storage technologies, and (c) ICT-based platform and application for farmers' use; these will not involve any civil works in terms of scope and outputs, undertaken only on the existing farmer's farm land and/or the existing government-owned or grain processors' premises;
(ii) pilot sites will be selected in the districts where rice, wheat and maize are the major produce (e.g., Sheikhupura, Hafizabad, Okara and Pakpattan) through stakeholder consultations and discussion by the PAD and ADB TA Team; the PAD will facilitate obtaining permits and clearances in case such arrangements are required at the TA inception stage;
(iii) pilot testing amount does not exceed 30% of ADB financing amount including ADB-administered trust fund financing estimated for the TA;
(iv) proposed activities do not result in any potential adverse environmental and/or social impacts, and a rapid environmental assessment will be undertaken at the TA inception stage to ensure that this requirement is met following ADB's Safeguard Policy Statement (2009);[15]
(v) goods and services required for the pilot testing will be procured by TA consultants using the provisional sum;
(vi) assets procured and/or created by the TA will be handed over to the PAD, the TA's executing agency, at the completion of the TA; and
(vii) application of the pilot results will be incorporated in investment opportunity plan including ADB-financed investment prepared under TA output 4.

9. The TA Review Mission, together with the executing agency, will monitor the above items and ensure compliance required during the implementation.

10. This plan will be discussed by the executing agency, ADB TA team, and TA consultants, and may be updated and/or amended during the TA implementation.

[15] Pilot activities that meet Category C for environment, involuntary resettlement and indigenous are allowed to be implemented.