



Completion Report

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Building Sustainable Food and Nutrition Security in Asia and the Pacific (Phase 1)

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TECHNICAL ASSISTANCE COMPLETION REPORT

TA Number, Country, and Name: TA 9057-REG: Building Sustainable Food and Nutrition Security in Asia and the Pacific (Phase 1)		Amount Approved: \$1,000,000	
		Revised Amount: \$2,500,000	
Executing Agency: ADB	Source of Funding: TASF-V: \$1,000,000 TASF-Other Sources: \$500,000 CCF: \$1,000,000	Amount Undisbursed: \$610,792.06	Amount Used: \$1,889,207.94
TA Approval Date: 11 December 2015		TA Signing Date: 11 December 2015	
		TA Completion Date	
		Original Date: 31 December 2018	Latest Revised Date: 10 December 2020
		Financial Closing Date: 3 August 2022	Number of Extensions: 1
TA Type: Knowledge and Support TA	Nature of Activity: Not applicable	TA Arrangement: Not applicable	

Description

Food and nutrition insecurity persists in Asia and the Pacific region, and many developing member countries (DMCs) are off track to achieve Sustainable Development Goal (SDG) 2. The coronavirus disease (COVID-19) pandemic and Russian invasion of Ukraine further exacerbated the situation and intensifying adverse impacts of climate change on food systems, making the SDG 2 attainment even more challenging. To reverse this trend, DMCs require to invest more in innovations, partnerships, and new business approaches to effectively support resilient and inclusive food system transformation. The technical assistance (TA) aims to contribute to the DMCs' efforts by supporting the demonstrations and pilot testing of promising and innovative business approaches and technology solutions through partnerships. The TA activities strategically focused on smallholder farmers and their engagement in inclusive agribusiness value chain development, upscaling of climate-smart agriculture (CSA) practices, and applications of digital technologies in agribusiness and rural development.

Expected Impact, Outcome, and Outputs

The expected impact was safe, nutritious, and affordable food for all in DMCs. The outcome of the TA was knowledge solutions on climate-smart agriculture and inclusive and sustainable agribusiness value chains for DMCs increased. The TA outputs were climate-smart agriculture interventions tested and introduced (Output 1), approaches to develop inclusive and sustainable agribusinesses value chain tested and introduced (Output 2), and partnerships with centers of excellence developed for innovations and knowledge dissemination (Output 3). A minor change in TA scope and implementation arrangements, increase in TA amount, and extension of TA completion date was processed on 29 November 2018 in response to increased demand during implementation and revised relevant targets, accordingly. Additional activities were provided for Outputs 1 and 2 to cover climate-smart agriculture initiatives, and studies on agriculture value chain and digital applications for agribusiness.

Implementation Arrangements

The TA was implemented from January 2016 to December 2020. The Rural Development and Food Security (Agriculture) Thematic Group (RDFS TG) Working Groups on Climate-Smart Agriculture and Agribusiness Value Chains Development planned and implemented the TA activities in coordination with relevant project teams. The Rural Development and Food Security (Agriculture) Thematic Group Secretariat (SDTC-AR) administered the TA activities. A minor change in scope and implementation arrangements was also approved on 29 November 2018 to accept additional funding of \$1.5 million [(\$0.5 million from TASF and \$1 million from the Climate Change Fund (CCF))] and extend the TA closing date to 10 December 2020. The TA funded the engagement of 82.19 person-months of international consulting services and 120.27 person-months of national consulting services compared to the planned inputs of 82.22 person-months and 123.28 person-months, respectively, including experts engaged under resource person contracts. The TA utilized only 75% of the total resources mainly because planned field activities and events that accounted for 19% of the TA fund had to be halted and eventually cancelled due to the COVID-19 pandemic and consequent lockdowns. The Asian Development Bank (ADB) engaged experts mostly from the Consultative Group on International Agricultural Research (CGIAR) Research Program on Climate Change, Agriculture, and Food Security (CCAFS) for CSA activities, and universities and various private companies for agribusiness value chain activities. The planned engagement of the Investment Center of the Food and Agriculture Organization of the United Nations (FAO)

did not materialize due to administrative difficulties in engaging United Nations agency staff except for the joint efforts to produce e-learning programs. The performances are rated satisfactory.

Conduct of Activities

Output 1 supported four testing and demonstrations of CSA practices, including alternate wetting and drying and climate-resilient rice varieties in Bangladesh; an impact evaluation of satellite-based weekly irrigation water advice in Bangladesh; administrative reform to expedite the national release of drought-resistant and zinc-fortified wheat varieties in Nepal; and a trial to leverage private green finance to upscale sustainable rangeland management practices based on a scientific study in Mongolia. Their results were discussed and disseminated at in-country workshops and seminars, some of which helped shape pipeline projects. Technical reports were prepared with CCAFS and World Food Logistics Organization, and FAO.

Output 2 supported the development and testing of inclusive agribusiness business models in the People's Republic of China, direct trading of farmer producer groups (FPOs) with private agribusiness companies, and an e-commerce and logistics service to link farmers directly with urban consumers in India. The latter demonstrated promising business collaboration models among private companies, FPOs, and the government for upscaling under a horticulture value chain project, while the former did not result in any good business models to follow. Three scoping studies to understand and identify promising industries and technologies were also carried out, including a vegetable market and value chain study in Mongolia, which helped design the ensuing loan project; a scientific study on emerging biotechnology applications and promising agricultural input companies in India and Viet Nam; and a study on digital agriculture services in Pakistan (Appendix 3).

Output 3 supported five workshops that SDTC-AR organized with CCAFS, FAO, and Japan Aerospace Exploration Agency to discuss international best practices, review ADB's sector pipeline projects, and find ways to make ADB's sector investments climate-smart by 2020 and maximize CSA investments. A [Knowledge Partnership Agreement](#) was signed with the International Research on Rice Institute to support the upscaling of CSA practices, and co-organized pilot testing and workshops on climate-resilient rice variety development. With CCAFS, the CSA Working Group co-organized two training programs for project teams in DMCs to enhance climate investments, workshops on pipeline screening for boosting climate investments, sustainable rangeland management in Mongolia, sustainable protein, and plant-based meat. It also collaborated with the International Maize and Wheat Improvement Center /HarvestPlus to expedite the national release of climate-resilient rice varieties in Nepal. With Grow Asia and several private companies, seminars were organized to share best use cases of digital agriculture services for climate resilience, inclusive food value chains development, food safety, and traceability, precision agriculture, and efficient supply chain management in South and Southeast Asia.

Technical Assistance Assessment Ratings

Criterion	Assessment	Rating
Relevance	The TA is well aligned with ADB's Operational Plan for Agriculture and Natural Resources: Promoting Sustainable Food Security in Asia and the Pacific in 2015–2020 , Strategy 2020 , Strategy 2030 and climate-resilient agriculture and food security strategies of participating DMCs and remained relevant till completion as food and nutrition security challenges had further intensified due to supply chain disruptions and economic downturns caused by COVID-19. The TA outcome is aligned with participating DMCs' priority to address such challenges, and the TA design chain allowed direct contribution to the governments' efforts by facilitating trials of promising technologies and business solutions prior to large-scale investments and improving institutional capacity and critical technical skills. TA activities were planned and implemented with RDFS TG working groups and sector project teams to identify and address diverse food security issues of participating DMCs' interest. The timely support for essential in-depth analysis contributed to strategic investment formulation and designing of sector pipeline projects. The TA helped introduce important learning from relevant global practices and testing of relevant innovations in participating DMCs together with the governments, project teams, private companies, farmer groups, and centers of excellence.	Highly relevant
Effectiveness	At least two DMCs are adopting introduced knowledge solutions to address food and nutrition security challenges under ensuing investment projects. All the TA outputs achieved their targets, a number overachieved and have directly contributed to designing innovative features of ADB sector projects in India and Mongolia. Knowledge sharing and learning events were organized with relevant ADB resident missions and government institutions for effective knowledge dissemination and learning.	Highly effective

Criterion	Assessment	Rating
Efficiency	The TA implementation was planned for three years and extended for two more years to accommodate additional financing and the emerging needs in DMCs. The TA utilized 75% of its financial resources. There is no issue with financial reporting and procurement. Due to field-based activities that were heavily affected by logistical difficulties, restricted field visits, and illness of project staff under COVID-19 pandemic, originally planned activities amounting to 19% of the total TA funds were delayed for no more than two years necessitating exploration of alternative arrangements and cancellation. Despite the difficulties, however, the targets were achieved within budget. The TA was also able to quickly respond to the dire need to sell farm produce to urban consumers under lockdown by setting up an e-trading platform together with the government, agribusiness and logistics companies that linked farmers' groups directly with urban consumers in Maharashtra, India. The knowledge sharing and learning events, including consultations with women farmers on the use of digital agriculture services, were able to continue virtually under the lockdown, thanks to the effective use of low-cost social media and local networks of the resident missions, government institutions and partner companies. Virtual missions and workshop arrangements through mobile applications were able to reduce some travel and logistics costs, while facilitating wider stakeholder participation in rural communities. There were delays experienced in the filing of claims of consultants due to (i) insufficient supporting documents; (ii) expenses beyond contract provisions; (iii) mismatched budget item codes; and (iv) unresponsiveness of consultants in addressing issues and submitting certifications.	Efficient
Overall Assessment	The TA was instrumental in supporting participating DMCs to address their various food and nutrition security issues and help introduce innovative features in ADB's sector investments by providing analysis and testing of innovative approaches and technology applications with various stakeholders to be upscaled under ensuing ADB investment projects. The TA was highly relevant in responding to emerging food and nutrition security challenges and priorities of DMCs, highly effective with target outcome and outputs achieved and implemented efficiently within budget.	Highly successful
Sustainability	The proven approaches and technology solutions demonstrated during the TA implementation were integrated into ADB's ongoing and proposed sector projects, which provided resources to continue and expand the activities. Business models and capacity building activities for participating farmers and agribusiness companies and the government's support system developed for the TA activities can ensure sustainability as they increase scale and generate commercial opportunities.	Most likely sustainable

Lessons Learned and Recommendations

Design and/or planning	While many DMCs share the challenges of supporting pro-poor agribusiness value chain development by integrating millions of smallholder farmers into food value chains, each value chain requires context-specific solutions and different approaches. The TA demonstrated a systemic approach to generate relevant insights required to develop innovative, inclusive, and integrated business development models with value chain assessments and facilitation of consultations among key private agribusiness, food logistics, and processing companies and farmer groups. The TA funded scoping studies and training on important climate-smart practices for relevant institutions and project beneficiaries in specific countries, landscapes, and industries. These underlying analyses and consultations were effective in informing future investments of DMCs and sector project teams.
Implementation and/or delivery	The engagement of the RDFS TG Working Groups, consisting of country and sector project teams, in TA planning and implementation was instrumental in delivering relevant outputs for the priority food and nutrition security agenda of participating DMCs and corresponding ADB investments. The process also generated ownership of TA activities among the relevant project teams, their counterpart governments, farmer groups, and private sector stakeholders.
Management of staff and consultants	Strategical alignment of TA activities with project processing and pipeline development work of ADB's sector divisions was critical in mobilizing substantial support of ADB resident missions, the government counterparts, and experts. The TA generated systemic upscaling opportunities for proven approaches and technology applications.
Knowledge building	Knowledge dissemination workshops were effective in sharing generated insights and discussing relevant future investments among various ministry and state government staff, farmer groups, and private company representatives. Encouraging women farmer representatives to participate in such

	events helped ADB better identify essential technologies, understand how women can benefit from them, and improve approaches to TA implementation.
Stakeholder participation	Wide stakeholder participation in TA reviews, knowledge dissemination workshops, and training programs effectively facilitated decision making on upscaling of introduced innovations under sector investment projects. Frequent consultations with private input companies, cold storage, food logistics, retailers and processors, exporters, financial institutions, and farmer groups were effective in finding critical issues to support inclusive and resilient agribusiness value chain development and promising business solutions and technologies to address them.
Partnership and cofinancing	The TA engaged various experts from partner research institutions to carry out analytical activities. While some specialized centers of excellence have brought valuable knowledge contribution, some emerging issues and new industry practices such as safety, and regulations on plant-based protein, biotechnology applications in the agricultural input industry, and emerging green financing opportunities for smallholder farmers, required expertise from a much wider network of researchers and industry practitioners.
Replication and/or scaling up	Some of the TA activities have contributed to designing sector projects and their replication under pipeline projects. Other studies and new business approaches development supported by the TA failed to find appropriate investees or provide useful inputs for investment design work. In both cases, the TA allowed project teams and their counterparts to learn from trial and errors and contributed to better investment decision making based on critical technical and market insights. Such a knowledge-based approach in project identification and development is considered vital to effectively respond to diverse and dynamic food and nutrition security challenges and maximize the development impacts of the sector investments.
Post-TA financial resources	As a follow-on action, the same support system continues under TA 6884: Green and Resilient Rural Recovery through Agri-Food System Transformation in the Asia and Pacific Region .

Follow-up Actions

Analysis and solutions development should be improved in terms of inclusiveness of climate investments and digital solutions and ways to address nexus issues that concern agriculture, natural resources, and rural development and multiple other sectors. The food system transformations required for climate change adaptation should offer greater opportunities for women empowerment, for example. Based on a good understanding on the absorptive capacity of women, indigenous groups, and vulnerable social groups, more tailored solutions, better targeting, and scaling by effectively linking the interventions with the graduation process of social safety net, can be done with better use of data analytics. A more integrated approach to deal with nexus issues (i.e., food-feed-fuel-climate change nexus) is also important as they increasingly place binding conditions on commodity markets and the state of food and nutrition security of DMCs. Analysis on the nexus policy issues concerning water, food, and energy security in DMCs is also critical in developing an enabling environment to increase investments in support of necessary food system transformation in the region.

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DESIGN AND MONITORING FRAMEWORK

[illegible]

Results Chain	Performance Indicators with Targets and Baselines	Achievements
3. Partnerships with centers of excellence developed for innovations and knowledge dissemination	<p>3a. At least 2 knowledge events carried out under new partnerships or business collaboration arrangements with COEs or private sector entities for collaborative works in ANR identified and developed by 2018 (2015 baseline = 0)</p> <p>3b. Gender perspective integrated in at least 1 knowledge event and 1 new partnership developed by 2020 around climate-smart agriculture and agribusiness value chain development</p>	<p>3a. Overachieved. Various knowledge events carried out jointly with centers of excellence and partner companies, including 2 CSA training programs at JRO and TRM (with CCAFS, FAO, and WUR), CSA workshop in BRM (with IRRI), a virtual workshop on sustainable livestock and plant-based meat (with CCAFS, CAAS, WUR, and Nanyang Technical University).</p> <p>3b. Overachieved. One (1) major training (training of trainers) and 1 major workshop plus several field workshops were completed. Workshops and training programs were organized on the use of modern postharvest practices to extend crop shelf lives and minimize food waste while considering gender roles as women as the dominant workers in the process. An AgriTech workshop included women farmer group representatives to reflect gender perspectives in the technology selection. One (1) KPA signed with IRRI and new partnership with CCAFS/CGIAR helped many CSA-related work. Work with Grow Asia facilitated many private-public consultations on food system transformation while continued partnership with FAO also provided technical inputs for CSA work.</p>

Results Chain	Performance Indicators with Targets and Baselines	Achievements
Actual Key Activities with Milestones (Appendix 3) 1. Climate-smart agriculture interventions tested and introduced 1.1 Analyzed international best practices among both public and private investments in promoting climate-smart agriculture that ensures environmental sustainability in developing countries. 1.2 Climate-Smart Agriculture Working Group of RDFS TG screened ANR pipeline projects with CCAFS and identified opportunities to test CSA best practices under ADB projects; and prepared technical feasibility studies for pilot activities in Bangladesh, Mongolia, and Nepal together with relevant project team leaders. 1.3 Implemented and monitored the selected pilot tests as integral parts of ADB's ongoing or pipeline projects; produced technical reports summarizing key findings of the pilot activities; and organized workshops together with BRM, MNRM, INRM and discussed key findings.		
2. Approaches to develop inclusive and sustainable agribusiness value chain tested and introduced 2.1 Analyzed and consulted with banks that finance smallholder agriculture, CSOs that focus on integrating smallholder farmers into commercial agribusiness value chains, innovative digital agriculture service providers, and researchers on a wide range of relevant technologies and innovative institutional settings, logistics, financing, and business models in the ANR sector that can generate transformational impacts in ensuring environmental sustainability as well as the beneficial engagement of a large number of smallholder farmers, particularly women farmers, in commercial food value chain development. Based on DMCs' needs, the Agribusiness Value Chain Working Group of RDFS TG selected inclusive agribusiness value chains business models to be tested in PRC and India. 2.2 Prepared for and implemented the selected pilot activities under ADB projects in consultation with various stakeholders including government agencies, farmer groups, particularly women, financial institutions, agribusiness companies, and research organizations; carried out scientific and marketing studies on emerging industries and promising technologies as well as policy analysis to identify investment opportunities for both private sector and the public sector to develop inclusive and sustainable value chains; produced reports summarizing key findings of the pilot activities and analytical works; organized knowledge dissemination events with INRM, sessions at the Central Asia Regional Economic Cooperation (CAREC horticultural agribusiness value chain regional workshop, Digital Development Forum 2018, and Asia Water Forum 2018.		
3. Partnerships with centers of excellence developed for innovations and knowledge dissemination 3.1 Negotiated the concept and scope of collaborative activities for upscaling climate-smart agriculture practices with IRRI, signed KPA and carried out AWD and climate-smart agriculture trial in Bangladesh together with project team and BRM. 3.2 Analyzed ADB's pipeline projects, identified climate investment opportunities, implemented trials and scientific studies with CCAFS and relevant project teams, consulted with country offices and working groups of Grow Asia, and co-organized several knowledge dissemination events on inclusive and sustainable agribusiness value chain development in South and Southeast Asia.		
Actual Inputs Asian Development Bank: \$1,332,175.37 Climate Change Fund: \$557,032.57		

ADB = Asian Development Bank, ANR = agriculture, natural resources, and rural development, AWD = alternate wetting and drying, BRM = Bangladesh Resident Mission, CAAS = Chinese Academy of Agricultural Science; CAREC = Central Asia Regional Economic Cooperation, CCAFS = CGIAR Research Program for Climate Change and Food Security, CGIAR = Consultative Group on International Agricultural Research, COE = Centers of Excellence, CSA = climate-smart agriculture, DMC = developing member country, FAO = Food and Agriculture Organization of the United Nations, FPOs = farmer producer groups, INRM = India Resident Mission, IRRI = International Rice Research Institute, JRO = Japanese Representative Office, KPA = knowledge partnership agreement, PRC = People's Republic of China, MNRM = Mongolia Resident Mission, NRM = Nepal Resident Mission, RDFS TG = Rural Development and Food Security (Agriculture) Thematic Group, SDG = Sustainable Development Goal, TA = technical assistance, TRM = Thailand Resident Mission, UN = United Nations, WUR = Wageningen University and Research, Source: Asian Development Bank.

TECHNICAL ASSISTANCE COST

Table A2.1: Technical Assistance Cost by Activity
(\$'000)

Item	Amount		
	Original	Revised	Actual
1. Consultants	785.00	1,906.00	1,545.14
2. Goods	10.00	10.00	5.94
3. Training, seminars, and/or conferences	50.00	124.00	181.53
4. Surveys	50.00	50.00	44.80
5. Miscellaneous TA administration	5.00	5.00	53.39
6. Pilot testing	50.00	280.00	58.40
7. Contingency	50.00	125.00	-
Total	1,000.00	2,500.00	1,889.20

TA = technical assistance.

Source: Asian Development Bank estimates.

Table A2.2: Technical Assistance Cost by Fund
(\$'000)

	TASF	CCF	Total Cost
1. Original	1,000.00	0.00	1,000.00
2. Revised	1,500.00	1,000.00	2,500.00
3. Actual	1,332.17	557.03	1,889.20
4. Unused	167.83	442.97	610.80

CCF = Climate Change Fund, TASF = Technical Assistance Special Fund.

Source: Asian Development Bank estimates.

TA 9057-REG: BUILDING SUSTAINABLE FOOD AND NUTRITION SECURITY IN ASIA AND THE PACIFIC (PHASE 1): COMPLETED ACTIVITIES (2016-2020)

Output		Completion	Details (publications and reports hyperlinked)
Output 1: Climate-smart agriculture interventions tested and introduced (Targets 1a and 1b by Climate-Smart Agriculture Working Group)			
REG	A seminar on the use of satellite and remote sensing technologies to build climate resilience while maximizing crop productivity (With JAXA /CWRD/ University of Washington)	Nov 2016	The seminar discussed (i) field experiences in applying a combined use of satellite imagery, remote sensing technologies, crop models, and SMS for precision irrigation advisory in Pakistan and (ii) potential upscaling of the technology solution from 20,000 farmers to 100,000 farmers for increased irrigation water and energy use efficiency, and food production.
REG	3 climate-smart agriculture pipeline screening workshops (with FAO/WB/CGIAR)	Nov 2017	The RDFS TG Climate-Smart Agriculture Working Group organized a workshop on upscaling climate-smart agriculture to discuss relevant international best practices. A workshop with CCAFS assessed ADB's pipeline investments in agriculture and natural resources sector, discussed a plan to make ADB's sector investment climate-smart by 2020 and a strategy to maximize climate investments in the sector. In addition, an external climate-smart agriculture expert evaluated ADB's sector pipeline projects and advised on potential climate investment proposals to the Green Climate Fund.
BAN	Pilot testing of climate-smart on-farm practices for irrigation projects (L3135-BAN: Irrigation Management Improvement Project)	Aug 2017	Testing of a set of climate-smart agricultural practices (i.e., improved rice varieties for water scarce areas; alternate wetting and drying and harvest mechanization) was carried out in partnership with IRRI and 5,000 smallholder farmers under the L3135-BAN: Irrigation Management Improvement Project . The introduced on-farm practices proved climate-smart (adaptation + mitigation+ increased food supply): The test resulted in the rice yield increase of 10% on average, while methane emission was reduced by 40% and water saving increased by 20%-30%. Based on the success test, various sets of climate-smart agriculture practices and demonstrations were rolled out in Bangladesh, Cambodia, and Nepal under KSTA 9218: Investment Assessment and Application of High-Level Technology for Food Security in Asia and the Pacific. A national workshop was organized in August 2017 at ADB Bangladesh Resident Mission for knowledge sharing.
REG	Climate-Smart Agriculture Training for Practitioners	Oct 2018	Technical training for ADB staff and DMC counterpart project staff was organized at the Japanese Representative Office to gain practical knowledge on climate-smart agriculture best practices, nature of mitigation and adaptation measures in agriculture, natural resources, and rural development (ANR) management, and climate investment estimation. ADB project practice sessions estimated their corresponding climate

Output		Completion	Details (publications and reports hyperlinked)
			investments and discussed ways to make them climate-smart.
REG	2018 Asia Water Forum events (With Water SG)	Oct 2018	Side events of the 2018 Asia Water Forum discussed the use of digital agriculture services, sensor technology and artificial intelligence to effectively address climate risks by reducing water and energy use while increasing crop yields in India and Pakistan.
PRC	Forestry development Strategy in PRC (publication and workshop, with EAER)	Dec 2018	An action plan aligned with the Ecological Security Strategy for the core grain growing area in Henan was prepared to focus on forestry-related issues. A supplementary study was undertaken for TA 8962: Building Ecological Security System in the National Core Grain Growing Area .
REG	Climate-Smart Agriculture Investment Planning (a training program co-organized with CCAFS and FAO)	Oct 2019	At the training workshop on climate-smart agriculture projects at the Thailand Resident Mission, organized by ADB, CCAFS and FAO for ADB project staff, discussed climate-smart agriculture (CSA) best practices for livestock, aquaculture, agribusiness value chains, and watershed management projects. The practice sessions discussed ADB project cases and ways to make them climate-smart while maximizing climate investments.
REG	A technical report on CSA best practices (With CCAFS)	2020	CSA best investment cases were developed by CCAFS experts based on a survey of relevant international best practices and discussed at the TG CSA working group members. Additional draft sustainable livestock cases were developed, and all best practice cases were summarized in a draft technical report (to be combined with relevant studies and published in 2022).
NEP	A testing of accelerated administrative process for expediting national release and Upscaling the Dissemination of Zinc-Biofortified and Climate Resilient Wheat Varieties (With CIMMYT/HarvestPlus, SAER and NRM)	Dec 2020	Support was provided for upscaling the dissemination of newly developed 2 climate-resilient and zinc-fortified wheat varieties as part of an ongoing policy dialogue on seed policy under the ongoing policy-based loans (i.e., seed multiplication for initial demonstration, and onsite variety growth testing and the development of a system for seed production, and dissemination). The support of CIMMYT/HarvestPlus helped accelerate the national release administration for 2 zinc-biofortified wheat varieties and contributed to upscaling their seed production and distribution. This improved institutional coordination system to shorten the national release administration of climate-resilient seed varieties was considered critical for adaptation. Another promising way to quickly develop and avail climate-resilient varieties for farmers to better address varying climate risks is to participate in the growing regional seed trade agreement initiated by IRRI, which allows sharing of national testing data of new varieties and releasing

Output		Completion	Details (publications and reports hyperlinked)
			the new varieties from other countries within 6 months.
MON	A scoping study for leveraging private green finance for upscaling sustainable rangeland management practices in Mongolia (With CCAFS, EAER and MRM)	Dec 2020	A study was conducted to scope out a system required to encourage the CSA practice adoption among 60,000 herders, monitor and verify the adoption of CSA best practices, and leverage financing from private investors. A workshop was organized to discuss the key findings among ADB project and RM staff in October 2020 . Based on the study, consultations with 7 private green investment funds were carried out, and a potential co-investment for ADB projects with a private green fund (i.e., prefinance of carbon credit for conservation and rural livelihood improvement) and a private buyer company (i.e., supply chain linkage development for sustainable cashmere) are being negotiated as of this writing.
BAN	A testing of irrigation advisory services with rice farmers in Bangladesh for Upscaling of climate-smart agriculture practices: Application of Satellite and Sensor Technologies in Agriculture and Natural Resources (With SAER and University of Washington).	Dec 2020	Proven irrigation advisory system backed by satellite and sensor technology applications, developed by the University of Washington, were tested with 1,000 rice farmers in Bangladesh for potential upscaling. The weekly advisory system sends farmers text messages on how much water they should (or should not) use to irrigate their crops, benefitting 100,000 farmers in Pakistan. The system realized substantial water and energy savings, crop yield gains and doubling of farm incomes. Based on the results of an impact evaluation of the testing , the government of Bangladesh would consider upscaling the system for the efficiency of irrigation water and energy use, while increasing farm incomes and disseminating climate-smart farming practices.
PAK	Assistance to address locust attack (with CWER)	2020	Experts were deployed to monitor, assess, and address intensified locust attack and crop damage. The experts carried out a survey of international best practices on locust & pest management and national system for their application to Pakistan.
REG	eLearning programs on Climate-smart aquaculture and fishery , and Climate-smart forestry (With FAO)	2020	In partnership with the FAO CSA group, the TA developed 2 e-learning programs for practitioners to help design better projects to upscale CSA in developing countries. The CSA Working Group carried out technical reviews of the programs.
IND	Post-harvest technologies and supporting infrastructure to reduce postharvest loss, extend shelf lives and add value to horticulture value chains (For L4117-IND: Maharashtra Agribusiness Network Project)	Q4 2018–Q1 2020	The adoption of modern post-harvest technologies to realize enhanced quality and longer shelf lives of horticulture crops is a pre-requisite for farmer groups to access fresh marketing opportunities in modern horticulture value chains. The adoption of technology can reduce waste, help farmers realize higher prices, and access new marketing channels. The study (i) evaluated the existing postharvest practices and food loss in 10 horticulture crop value chains ; (ii) identified suitable technologies including biotechnologies and digital agricultural services) to minimize the loss; (iii) proposed facilities and

Output		Completion	Details (publications and reports hyperlinked)
			<p>infrastructure to support the technology adoptions of smallholder farmers; and (iv) carried out the training of trainers with lead farmers and horticulture industry representatives; and (v) and produced video extension materials to introduce upgraded postharvest practices with the government, experts at the University of California Davis Postharvest Center, the World Food Logistics Organization, and horticulture industry. A final workshop in June 2020 was virtually carried out to discuss the key findings and ways to half the postharvest loss in the horticulture value chains.</p> <p>Due to the COVID-19 pandemic and lockdown, harvest maturity indices development for custard apple and sweet lime by the local research institutions had to be canceled.</p>
REG	A study on sustainable livestock best practices and plant-based meat value chain development (With CCAFS, CAAS, Wageningen University, PSOD and SEER)	2020	<p>Climate scientists together with ADB project teams developed 3 sustainable livestock investment cases, 1 plant-based meat value chain case, and a sustainable protein investment framework to demonstrate the industry's best practices for enhancing food security and rural livelihood while minimizing greenhouse gas emission intensity and environmental footprints. A workshop to discuss the report was organized in June 2021 with discussants from ADB, IIASA, the Good Food Institute, Nanyang Technical University and Code Partners. A publication is planned in 2022.</p>
Output 2: Approaches to develop inclusive and sustainable agribusiness value chain tested and introduced (Targets 2a and 2b by Agribusiness Value Chain Working Group)			
PRC	A study for Inclusive agribusiness model development (With Rabobank for L3567- PRC: Shanxi Inclusive Agricultural Value Chain Development Project)	Dec 2016	The agribusiness market and value chain studies (i) generated analysis of three agricultural commodity value chains and (ii) designed inclusive agribusiness models for PRC: Shanxi Inclusive Agriculture Value Chain Development Project .
NEP	Agricultural enterprise model for value chain finance in Nepal (With SAER and SAEP for L3856-NEP: Rural Enterprise Financing project)	Jan 2017	A feasibility study was carried out with South Asia Department teams to design an innovative agribusiness financing scheme to leverage investments and financing for farmer groups and small- and medium-sized enterprises (SMEs) and engage them into viable agribusiness value chain development.
CWRD	CAREC regional workshop on agribusiness (With CWER)	Mar 2017	Technical inputs such as analysis on agribusiness market and its growth prospect in the CAREC region and innovative supply chain logistics practices were prepared for the agribusiness value chain development strategy discussion at the CAREC regional workshop.

Output		Completion	Details (publications and reports hyperlinked)
REG	2018 Digital Development Forum (Knowledge dissemination and technology use case development for pipeline projects, with EARD)	Sep 2018	At the 2018 Digital Development Forum side events, 3 cases on digital technologies in agribusiness and their applications to ADB's pipeline projects were discussed (i.e., blockchain for food safety and traceability , digital agricultural platform and machine learning for data-driven and precision agriculture ; and vertical integrations of fruits and vegetable value chains to link farmer groups with online grocery) in People's Republic of China and India.
MON	Market study and value chain analysis for vegetable farming in Mongolia (For L3895 & L3896- MON Vegetable Production and Irrigated Agriculture Project)	Nov 2018	A market and vegetable value chain study has been carried out to inform the design of the ongoing Japan Fund for Prosperous and Resilient Asia and the Pacific (JFPR)-funded project and an ensuring loan project.
VIE and IND	A scientific study on sustainable biotechnology applications in agricultural input industry (with Microbe and Biotechnology program of CIAT, ICRISAT and PSOD)	Mar 2019	The International Center for Tropical Agriculture (CIAT) Viet Nam and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) carried out a technical evaluation of biochemical technologies used by agricultural input companies in Viet Nam and India, respectively, and identified innovative technologies to effectively increase food production while ensuring environmental sustainability and food safety. A list of agriculture input companies that utilize such technologies have been identified for potential investment of PSOD, but no suitable candidates have been found.
PRC	Feasibility study for the application of IoT for agribusiness supply chain development in Gansu (For L3820-PRC: Gansu Internet-plus Agriculture Development)	2019	Analysis of IoT applications for inclusive agribusiness value chain development to inform a pipeline agribusiness value chain development project in People's Republic of China.
PHI	A policy study on Philippine rice tariffication law: Policy review and analysis of challenges and opportunities	2020	Policy study on rice tariffication and a survey of policy impacts on different segments of the population was carried out as a part of a policy-based loan processing.
IND	Mapping Study for horticulture value chain in Maharashtra (For L4117-IND: Maharashtra Agribusiness Network Project)	2019	A scoping study identified key players within 5 focus horticulture crop value chains, including retailers, processors, exporters, logistics and cold chain companies as well as farmer producer groups and women marketing groups; and carried out consultations and workshops to identify promising market for smallholder farmers and strategies to build essential market access. Based on the study an initial project concept for IND: Maharashtra Agribusiness Network Project has been developed.

Output		Completion	Details (publications and reports hyperlinked)
IND	Testing of e-Platform for directly connecting farmers in Pune with urban consumers under lockdown (For L4117-IND: Maharashtra Agribusiness Network Project)	Apr 2020	To help generate additional marketing opportunities for smallholder farmers under lockdown, who lost most of selling opportunities at the farmgate, the government of Maharashtra, India, private retail companies, farmer groups, and an online logistics service collaborated to test a direct sales link developed with urban consumers via e-platform, and successfully achieved 150 tons sales of fruits and vegetables for 540 farmers over 1.5 months. The TA financed the support of farmer groups and advertisements, while retail buyer companies paid the sales to farmers online and covered the cost of reefer vehicles. Urban consumer feedback showed improved quality of fresh vegetables and fruits.
IND	A testing of direct trading and capacity building of farmer producer groups (With Sahyadri Farms and Go4Fresh, L4117-IND: Maharashtra Agribusiness Network Project)	Q4 2019–2020	Based on the successful pilot test, several FPOs and farmers in Maharashtra, India supported by the TA, developed new direct supply linkages to 2 private horticultural retail companies with technical and managerial capacity building capabilities. The TA financed the cost of training, packaging material, cold storage rental for farmers, and crop experts' advisory. The 2 participating companies purchased citrus crops from farmers as they taught participating FPOs on improved standards, postharvest management, packaging, and distribution process required for direct trading. Due to the COVID-19 pandemic and lockdown, the planned activities had to be halted many times for months, and the full scale of field operations have yet to be realized. Once the movement restriction was lifted, remaining works and impact evaluation could be carried out.
PAK	Digital Solutions for Efficiency in Agricultural Value Chains (with CWER under TA 9902: Digital Solutions to Improve Agricultural Value Chains)	Dec 2020	A scoping study was completed on digital agriculture services that were effective in increasing productivity, market access and climate reliance of smallholder farmers in the country. An initial design of digital agricultural services platform was developed.
Output 3: Partnerships with centers of excellence developed for innovations and knowledge dissemination (Targets 3a and 3b)			
IRRI	Pilots, field testing and feasibility studies on climate-smart agriculture	Aug 2017	Activities in line with Output 1 continue to strengthen the IRRI and ADB knowledge partnership agreement signed in June 2016 . The agreement covered feasibility studies and pilot tests of climate-smart agriculture practices and technologies.
CCAFS	Climate-Smart Agriculture Training for Practitioners	Oct 2018	The technical training enabled ADB staff and DMC counterpart project staff to gain practical knowledge on climate-smart agriculture best practices, nature of mitigation and adaptation measures in agriculture and natural resources management, and climate investment estimation using selected ADB project cases.

Output		Completion	Details (publications and reports hyperlinked)
CCAFS	Upscaling climate-smart agriculture	2019–2020	CCAFS provided scientific and technical advisory for project formulation; helped draft a guidance note on climate investment tracking for ANR projects; implemented a scoping study and life cycle analysis to identify opportunities to develop ADB climate-smart agriculture project investments; and helped leverage private green finance. No formal partnership agreement was developed for collaborative work.
Grow Asia, World Economic Forum	Agribusiness value chain development and climate-smart agriculture	2018–2019	Co-organization of Grow Asia launch, workshops with IPSARD PPAF works, consultation workshops on digital agriculture tools. Organizations of consultations with the government of Maharashtra, India in partnership with Grow Asia/World Economic Forum were carried out to promote public and private partnerships in developing inclusive and sustainable agribusiness value chains. This partnership contributed to the design of an innovative horticulture value chain development investment in Maharashtra to be replicated in other states in India. No formal partnership agreement was developed for collaborative work.

CCAFS = CGIAR Research Program for Climate Change and Food Security, CGIAR = Consultative Group on International Agricultural Research, CIAT = The International Center for Tropical Agriculture, CSA = climate-smart agriculture, CIMMYT = International Maize and Wheat Improvement Center; FAO = Food and Agriculture Organization of the United Nations, FPO = farmer producers' organization, ICRISAT = International Crops Research Institute for the Semi-Arid Tropics, IISA = International Institute for Applied Systems Analysis, IoT = Internet of Things, IPSARD = Institute for Policy and Strategy for Agriculture and Rural Development, IRRI = International Rice Research Institute, JFPR = Japan Fund for Prosperous and Resilient Asia and the Pacific, PSOD = Private Sector Operations Department, SME = small- and medium-sized enterprise, SMS = short message service
Source: Asian Development Bank.