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Report No: PAD4704

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED LOAN

IN THE AMOUNT OF EUR 304.8 MILLION
(US$341.27 MILLION EQUIVALENT)

TO THE

REPUBLIC OF TURKEY

FOR A

TURKEY CLIMATE SMART AND COMPETITIVE AGRICULTURAL GROWTH PROJECT (TUCSAP)

March 9, 2022

Agriculture And Food Global Practice
Europe And Central Asia Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective February 28, 2022)

Currency Unit =	Turkish Lira
USD 0.07258132 =	TRY 1
EUR 0.89293687 =	USD 1
USD 1.1199 =	EUR 1

FISCAL YEAR
January 1 - December 31

Regional Vice President:	Anna M. Bjerde
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ABBREVIATIONS AND ACRONYMS

ABDGM	General Directorate of EU and Foreign Relations (*Avrupa Birliği Ve Diş İlişkiler Genel Müdürlüğü*)
AWPB	Annual Workplans and Budgets
BSL	Biosafety Level
B/C	Benefit/Cost ratio
BTGM	General Directorate of Information Technologies (*Bilgi Teknolojileri Genel Müdürlüğü*)
CBRT	Central Bank of the Republic of Turkey
CE	Citizen Engagement
CPF	Country Partnership Framework
CSA	Climate-Smart Agriculture
CGIAR	Consultative Group on International Agricultural Research
DA	Designated Account
DFIL	Disbursement and Financial Information Letter
DP	Development Plan
ESMF	Environmental and Social Management Framework
EU	European Union
E&S	Environmental and Social
FM	Financial Management
FP	Focal Point
FO	Field Officer
GAP	Good Agriculture Practice
GD	General Directorate
GKGM	General Directorate of Food and Control (*Gida Ve Kontrol Genel Müdürlüğü)*
GDP	Gross Domestic Product
GDPR	General Data Protection Rules
GHG	Greenhouse gases
GoT	Government of Turkey
GPN	General Procurement Notice
GRS	Grievance Redress Service
ICR	Implementation Completion and Results Report
ICT	Information and communication technology
IFC	International Finance Corporation
IFR	Interim un-audited Financial Reports
INDC	Intended Nationally Determined Contribution
IoT	Internet of Things
IPF	Investment Project Financing
IPM	Integrated Pest Management
IRR	Internal Rates of Return
Ha	Hectare
KPIs	Key Performance Indicators
LMP	Labor Management Procedures

MIS	Monitoring Information System
MoAF	Ministry of Agriculture and Forestry (*Tarim ve Orman Bakanlığı*)
MoTF	Ministry of Treasury and Finance (*Hazine ve Maliye Bakanlığı*)
MTR	Mid-Term Review
M&E	Monitoring and Evaluation
NPV	Net Present Value
OECD	Organization for Economic Co-operation and Development
OHS	Occupational Health and Safety
OIE	World Organization for Animal Health (formerly *Office International des Epizooties*)
PCU	Project Coordination Unit
PD	Provincial Directorate
PDO	Project Development Objective
PFMC	Public Financial Management and Control
PIU	Project Implementation Unit
PLF	Precision Livestock Farming
PLR	Program and Learning Review
POM	Project Operations Manual
PPSD	Project Procurement Strategy for Development
PSC	Project Steering Committee
RD&I	Research, Development and Innovation
RF	Resettlement Framework
SDD	Strategy Development Directorate
SEP	Stakeholder Engagement Plan
SOEs	Statements of Expenditures
STEP	Systematic Tracking of Exchanges in Procurement
TAGEM	General Directorate of Agricultural Research and Policies (*Tarimsal Araştirmalar Ve Politikalar Genel Müdürlüğü)*
TCC	Technical Coordinating Committee
TDİOSB	Specialized Organized Industrial Zone Based on Agriculture (*Tarıma Dayalı İhtisas Organize Sanayi Bölgesi*)
TFP	Total Factor Productivity
TORs	Terms of Reference
TRGM	General Directorate of Agricultural Reform (*Tarim Reformu Genel Müdürlüğü)*
TULIP	Turkey Resilient Landscape Integration Project
UTAEM	Izmir International Agricultural Research and Training Center (*İzmir uluslararası Tarımsal Araştırma ve Eğitim Merkezi*)
VCIs	Veterinary Control Institutes
WB	World Bank
WBG	World Bank Group

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DATASHEET

BASIC INFORMATION

Country(ies)	Project Name	
Turkey	Turkey Climate Smart and Competitive Agricultural Growth Project (TUCSAP)	
Project ID	Financing Instrument	Environmental and Social Risk Classification
P175011	Investment Project Financing	Substantial

Financing & Implementation Modalities

[ ] Multiphase Programmatic Approach (MPA)	[ ] Contingent Emergency Response Component (CERC)
[ ] Series of Projects (SOP)	[ ] Fragile State(s)
[ ] Performance-Based Conditions (PBCs)	[ ] Small State(s)
[ ] Financial Intermediaries (FI)	[ ] Fragile within a non-fragile Country
[ ] Project-Based Guarantee	[ ] Conflict
[ ] Deferred Drawdown	[ ] Responding to Natural or Man-made Disaster
[ ] Alternate Procurement Arrangements (APA)	[ ] Hands-on Enhanced Implementation Support (HEIS)

Expected Approval Date	Expected Closing Date
29-Mar-2022	31-Mar-2028

Bank/IFC Collaboration

No

Proposed Development Objective(s)

Strengthen capacity for sustainable and competitive agricultural growth and promote the use of climate-smart agriculture in targeted regions in Turkey.

Components

Component Name	Cost (US$, millions)

Component 1: Institutional Capacity Strengthening for Climate-Smart Agriculture Policy, Planning, and Investments	151.58
Component 2: Enhancing Animal Health Capacity for Effective Disease Surveillance, Diagnosis and Control	81.27
Component 3: Investments for Enhanced Productivity, Resource-Efficiency, and Climate Resilience	99.75
Component 4: Project Management, Monitoring, and Evaluation.	8.65

Organizations

Borrower:	Republic of Turkey
Implementing Agency:	Ministry of Agriculture and Forestry

PROJECT FINANCING DATA (US$, Millions)

SUMMARY

Total Project Cost	374.27
Total Financing	374.27
of which IBRD/IDA	341.27
Financing Gap	0.00

DETAILS

World Bank Group Financing

International Bank for Reconstruction and Development (IBRD)	341.27

Non-World Bank Group Financing

Other Sources	33.00
Local Beneficiaries	33.00

Expected Disbursements (in US$, Millions)

WB Fiscal Year	2022	2023	2024	2025	2026	2027	2028
Annual	0.00	28.89	37.17	75.38	85.95	90.55	23.33
Cumulative	0.00	28.89	66.06	141.44	227.39	317.94	341.27

INSTITUTIONAL DATA

Practice Area (Lead)

Agriculture and Food

Contributing Practice Areas

Digital Development, Energy & Extractives

Climate Change and Disaster Screening

This operation has been screened for short and long-term climate change and disaster risks

SYSTEMATIC OPERATIONS RISK-RATING TOOL (SORT)

Risk Category	Rating
1. Political and Governance	Low
2. Macroeconomic	Moderate
3. Sector Strategies and Policies	Low
4. Technical Design of Project or Program	Moderate
5. Institutional Capacity for Implementation and Sustainability	Substantial
6. Fiduciary	Substantial
7. Environment and Social	Substantial
8. Stakeholders	Moderate
9. Other	Moderate
10. Overall	Moderate

COMPLIANCE

Policy

Does the project depart from the CPF in content or in other significant respects?

[ ] Yes [✓] No

Does the project require any waivers of Bank policies?

[ ] Yes [✓] No

Environmental and Social Standards Relevance Given its Context at the Time of Appraisal

E & S Standards	Relevance
Assessment and Management of Environmental and Social Risks and Impacts	Relevant
Stakeholder Engagement and Information Disclosure	Relevant
Labor and Working Conditions	Relevant
Resource Efficiency and Pollution Prevention and Management	Relevant
Community Health and Safety	Relevant
Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	Relevant
Biodiversity Conservation and Sustainable Management of Living Natural Resources	Relevant
Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	Not Currently Relevant
Cultural Heritage	Relevant
Financial Intermediaries	Not Currently Relevant

NOTE: For further information regarding the World Bank's due diligence assessment of the Project's potential environmental and social risks and impacts, please refer to the Project's Appraisal Environmental and Social Review Summary (ESRS).

Legal Covenants

Sections and Description

LA, Schedule 2, Section I.A.1. The Borrower, through MoAF, shall have overall responsibility for Project implementation, including: (a) ensuring close coordination between ABDGM, TRGM, TAGEM, GKGM and BTGM (collectively the "General Directorates for the Project"), and with other relevant government and institutional entities; (b) ensuring the proper application of the Project requirements, criteria, policies, procedures, and organizational arrangements, as set forth in this Agreement and detailed in the Project Operations Manual; and (c) preparing, and furnishing to the Bank, all Project implementation documents, including Project supervision reports.

Sections and Description
LA, Schedule 2, Section I.A.2. By no later than sixty (60) days after the Effective Date, the Borrower, through MoAF, shall have established and operationalized, and shall continue to maintain throughout Project implementation: (a) a PCU, within ABDGM, for the purpose of carrying out the Project implementation responsibilities, including specifically the financial management, procurement, and environmental and social requirements of the Project; and (b) a PIU within each: (i) TRGM to carry out Parts 1.A, 3.A, 3.B, and 3.C of the Project, in close coordination with provincial directorates; (ii) BTGM to carry out Part 1.B of the Project; (iii) GKGM to carry out Part 2 of the Project; and (iv) TAGEM to carry out Part 3.D of the Project.

Sections and Description
LA, Schedule 2, Section I.A.3. By no later than sixty (60) days after the Effective Date, the Borrower, through MoAF, shall establish, and thereafter maintain throughout Project implementation, and coordinate the regular meeting of, a Project Steering Committee.

Sections and Description
LA, Schedule 2, Section I.A.4. By no later than sixty (60) days after the Effective Date, the Borrower, through MoAF, shall establish, and thereafter maintain throughout Project implementation, and coordinate the periodic meeting of: (a) a Technical Coordinating Committee; and (b) a monitoring and evaluation technical working group, represented by each of the General Directorates for the Project.

Sections and Description
LA, Schedule 2, Section I.B.1. The Borrower, through MoAF, shall maintain throughout Project implementation, a Project Operations Manual, in form and substance acceptable to the Bank.

Sections and Description
LA, Schedule 2, Section I.E.2(b). For the purpose of carrying out Part 3.B(i) of the Project, the Borrower, through MoAF, shall maintain a Matching Grants Manual, satisfactory in form and substance to the Bank, and incorporate the adopted Matching Grants Manual within the POM, and supervise, monitor, and report on the carrying out of the Subprojects financed by the Matching Grants in accordance with the Matching Grants Manual.

Sections and Description
Schedule 2, Section I.F. The Borrower, through MoAF, shall ensure that the Project is carried out in accordance with the Environmental and Social Standards, in a manner acceptable to the Bank, and ensure that the Project is implemented in accordance with the Environmental and Social Commitment Plan, in a manner acceptable to the Bank.

Conditions

Type	Financing source	Description
Effectiveness	IBRD/IDA	Loan Agreement (LA), Section 4.01. The Borrower, through MoAF, shall have prepared and adopted the Project Operations Manual ("POM"), in form and substance satisfactory to the Bank.

Type	Financing source	Description
Disbursement	IBRD/IDA	LA, Schedule 2, Section III.B.1(b). No withdrawal shall be made for expenditures under Category (2), unless and until the Borrower, through MoAF, has adopted the policies and procedures necessary for carrying out Part 3.A of the Project, in form and substance satisfactory to the Bank, and incorporated said policies and procedures as part of the POM.
Type	Financing source	Description
Disbursement	IBRD/IDA	LA, Schedule 2, Section III.B.1(c). No withdrawal shall be made for expenditures under Category (3), unless and until the Borrower, through MoAF, has adopted a Matching Grants Manual, in form and substance satisfactory to the Bank, and incorporated said Matching Grants Manual as part of the POM.

I. STRATEGIC CONTEXT

A. Country Context

1. **Turkey is a large, upper-middle-income country with a strong record of inclusive growth but has faced external and domestic shocks in recent years.** During the last two decades, Turkey urbanized dramatically, opened to foreign trade and finance, maintained strong macroeconomic and fiscal policy frameworks, and harmonized many laws and regulations with European Union (EU) standards. The decrease in poverty has been remarkable, and other indicators of wellbeing have also improved. Turkey's exemplary response to the influx of approximately 3.7 million Syrian refugees serves as a model for other countries. Over the past decade, however, rapid growth has been accompanied by stagnating productivity, a rising current account deficit, and a growing stock of foreign exchange–denominated debt. Policies to stimulate the economy after the failed coup led to economic overheating in 2017, double-digit inflation, and a large current account deficit.[1] The cumulative effects of these and other economic vulnerabilities came to a head in mid-2018, with the tightening of global economic conditions combined with tense international relations. These events triggered a significant depreciation of the Turkish lira and a downturn in the Turkish economy. Spending fell, inflation spiked, and the corporate sector struggled under an elevated debt burden. Close to one million jobs were lost as unemployment rose from 11% in January 2018 to 14.1% in January 2020. Per capita gross domestic product (GDP) fell from a high of US$12,582 in 2013 to US$9,793 in 2018 and progress in poverty reduction stalled.

2. **The COVID-19 crisis precipitated another economic shock, undermining the economic recovery that started in late 2019.** The national economy went through significant adjustments from late 2018 through 2019 as banks and corporations reduced their exposure to foreign currency debt, private sector credit growth resumed, and demand started to recover. Nonetheless, the economic rebound experienced in the 4th quarter of 2019 was short-lived as the COVID-19 pandemic took hold in early 2020.[2] Real GDP contracted by 10.4% in the second quarter of 2020. The government responded swiftly to COVID-19 with a large economic stimulus program, which represented 14% of GDP. The program focused on opening credit channels, loosening monetary policy and other regulatory measures and providing direct support. The stimulus generated a significant increase in economic activity in late 2020 that more than offset the decline recorded earlier in the year. Real economic activity over the full year was higher than in 2019, with Turkey exhibiting the fastest growth (1.8%) of all G20 countries aside from China. Reopening after the first wave of the pandemic also played a role in Turkey's economic recovery. However, the policy frameworks that ensured a strong economic rebound during the pandemic also heightened macroeconomic risks, including rising inflation, currency depreciation, corporate and banking sector vulnerabilities and erosion of reserve buffers.

3. **Turkey's economic performance has been a tale of two economies—overall high growth, matched by a negative outlook in macro-financial conditions in 2021**. A favorable base effect, an easing of restrictions permitted by accelerated vaccinations, and supportive external demand led to 11% GDP growth in 2021. However, personnel changes in the Central Bank in March 2021, and finalization of the monetary easing cycle since September 2021, created significant uncertainties that adversely affected macro-financial conditions. The Turkish lira depreciated sharply, inflation accelerated to its fastest rate over the last two decades, external pressures mounted, and corporate and financial sector vulnerabilities grew.

4. **The 2022 growth projection for Turkey reflects a slowing momentum with downside risks, coming off a high GDP base and macro financial turbulence in 2021**. Following a strong growth in 2021, growth is expected to be 2% and

[1] By 2018, poverty had declined to 8.5% from 33% in the early 2000s.
[2] As of 3rd of February 2022, about 86,000 Turkish people had died from COVID-19, and about 11 million had been infected.

3% in 2022 and 2023, respectively. External risks to the medium-term outlook are balanced, thanks to the declining current account deficit, increased reserves, and improved net short-term foreign exchange position of corporates. However, risks are recently heightened due to continued loosening of monetary policy that creates investor uncertainty, global liquidity tightening prospects, rapid spread of the COVID-19 Omicron variant, and rising supply chain constraints. The continuation of loose monetary policy in Turkey could further heighten market volatility, increase risk premia, and threaten macro-financial stability. Going forward, efforts to rebuild confidence and macro stability coupled with reforms focused on labor, product, and financial markets as well as on strengthening institutional capacity are needed to ensure sustainability of growth and employment generation in the medium term.

5. **Turkey's economic growth prospects must also be considered in light of the country's longer-term challenge to increase productivity sustainably and its vulnerability to climate risks.** Productivity growth has contributed less to overall growth in recent years. As a result, potential output—what the economy can produce when factor inputs are fully utilized—is estimated to have fallen 4%. Unless Turkey can produce more and better output with its available inputs, the return on those inputs, including labor, will stagnate. The economy is also contending with growing sustainability gaps as rapid demographic growth, urbanization, and industrialization exert heavy pressure on natural resources and the environment. The effects of climate change, including rising annual mean temperatures and changes in precipitation patterns, have expanded Turkey's exposure to natural disasters. The country now experiences more frequent extreme weather-related events such as floods, heatwaves, and droughts. With its diminishing surface water supply, Turkey is already considered a water-stressed country, with about 27% of its population living in water scarce areas.[3]

6. **The country has an opportunity to move rapidly to a more resilient, sustainable, and inclusive growth path as its economy recovers from COVID-19.** The pandemic has generated a profound awareness of the links between climate change, fragile ecosystems, economic growth, and human health. It has also highlighted food security issues due to interruption to agri-food supply chains and trade, resulting in increasing food prices. As pressures intensify to support post-pandemic economic growth, recovery, and jobs, Turkey has an opportunity to build back better, relying on strategies that can reduce its vulnerability to climate disasters, and avoid the depletion of its natural resources that weaken economic growth prospects. By incentivizing a green recovery and initiating a green transformation, Turkey can retain a competitive advantage as global markets—including the EU, Turkey's main trading partner—move to decarbonize. The agriculture sector will have a pivotal role in a green recovery strategy fostering a climate-smart, competitive, and resilient growth.

B. Sectoral and Institutional Context

7. **Turkey has taken advantage of its natural capital to build a large agriculture and food sector that contributes importantly to the economy**. In 2018, natural capital represented about 12% of Turkey's national wealth,[4] with the share of crop land and pastures reaching 90%. On average, the use of this land generates significantly more wealth for Turkey than for other peer countries.[5] The agriculture sector contributed 6.6% of GDP in 2020,[6] and employs about 18% of

[3] Water Scarcity Clock (https://worldwater.io/about.php)
[4] National wealth includes produced, natural and human capital, and net-foreign assets. It complements GDP and other macroeconomic indicators by measuring changes in a country's underlying asset base. Latest figures available are from 2018.
[5] Turkey is the global lead producer of hazelnuts, apricots, figs, dried raisins, and cherries and is among the top 5–10 global producers of 20 other agri-food products.
[6] This share of GDP far exceeds the average of countries in the Organization for Economic Co-operation and Development (OECD) (2.6%) and is close to the average for Upper Middle-Income countries (6.25% in 2019). OECD (2021), "OECD Economic Surveys: Turkey 2021." OECD Publishing, Paris. Available at https://doi.org/10.1787/2cd09ab1-en

Turkey's labor force.[7] During 2010–19, real agricultural GDP grew at an annual rate of 2.7%, which is below the overall economy's rate (5.38%) but represented a significant improvement over the languishing 2000–09 growth of 1.9%. More recently, it has grown faster (2.5%) than overall GDP (1.8%), which contracted significantly in late 2018 due to the recession. Recent estimates suggest that in 2020 the sector grew at an even higher rate (4.8%) than the overall economy (1.8%).[8] The sector's expansion has been fueled by growing domestic demand and changes in consumption patterns to favor more protein- and nutrient-rich foods (fruits, vegetables, fish, and animal products). Growing external demand has also driven the sector's expansion. Exports of agri-food products rose from US$3.6 billion in 2000 to about US$20.7 billion in 2020 and accounted for 10–11% of national exports. Through its participation in a customs union with EU countries[9] and free-trade agreements with 27 countries, Turkey has become a lead agri-food exporter worldwide.

8. **Agricultural performance has been quite mixed across Turkey's macro-regions.** Agricultural growth in Turkey has proven to be pro-poor, and it has considerable unrealized potential to expand prosperity.[10] Between 2004 and 2019, agricultural average growth in Central, Southeast, and Eastern Anatolia Regions was very dynamic surpassing 4%. This is important, considering that provinces in the Southeast and Eastern Anatolia Regions have the highest poverty rates in Turkey. However, agricultural growth was modest in the Aegean (2.77%) and Black Sea Regions (2.2%) while in the Marmara and Mediterranean Regions growth was below 2%. These modest rates are worrisome, as these regions combined provide nearly 65% of the national agricultural employment in Turkey (Aegean Region provides 16.2%, Black Sea Region 22%, Marmara 14%, and the Mediterranean 13%) and are important export poles.[11] Addressing constraints to improved sectoral performance and enhancing its climate resilience would go a long way toward reducing poverty, improving food security, and widening prosperity in rural Turkey.

9. **One reason for this mixed performance is that for some time the agricultural sector has been constrained by low productivity.** At an aggregated level, the sector has grown by 2.48% per year on average over the last two decades, but this growth has been very cyclical and for the most part lower than growth in the wider economy. Data on total factor productivity (TFP) show that growth in TFP has not only slowed but turned negative from 2012 to 2016 (–0.4%) as the input use index (land, labor, machinery, and so on) grew faster (1.3%) than the output index (0.9%). Growth in agricultural output has been driven primarily by input intensification and far less by improvements in resource-use efficiency and technological adoption. An analysis by the OECD[12] suggests that growth in the primary factors of production and in the use of intermediate inputs was responsible for 75% of the growth in output in Turkey between 2007 and 2016, with only 25% of that growth attributed to TFP. Gains in output per hectare (yields) have been particularly strong in cereal, fruit, and beef production, but they are offset by falling yields in key subsectors such as tree nuts, pulses, and dairy. Yields also tend to be volatile rather than steady, often experiencing boom-bust cycles (particularly in vegetables).

10. **Low agricultural productivity can partially explain the persistent inflation and volatility of food prices in Turkey.** High food price inflation and volatility have serious welfare implications, especially for poor households, in which food accounts for 29% of spending. Fresh vegetables and fruits, in particular, drive food price inflation (more recently beef has become a major driver), which has been increasing recently due to COVID-19 pandemic. An analysis by the World Bank

[7] Within its income group, Turkey has perhaps the largest share of agricultural workers in total employment.
[8] TurkiStat Report No. 37180 01, March 2021.
[9] The EU and Turkey have formed a customs union since 1995. Current arrangements cover a limited range of industrial products and exclude agriculture, public procurement, and e-commerce and services.
[10] Agriculture was responsible for 10% of the overall reduction in poverty experienced in Turkey over 2007–17 (Opportunities, Poverty and Inequality in 21st Century Turkey. The Road Traveled and the Journey Ahead. World Bank, 2020).
[11] The Aegean, Mediterranean and Marmara Regions concentrate the largest investments in greenhouse production in Turkey.
[12] The analysis is based on the TFP database of the U.S. Department of Agriculture.

(WB)[13] highlights the strong link between land productivity and food price inflation; food price inflation was lower in provinces where growth in land productivity was higher.

11. **Agriculture's vulnerability to climate change can increase food price pressures and overall food security concerns in Turkey.** Data from the Turkish State Meteorological Service confirms the increasing occurrence of extreme weather events, which are projected to occur more often as the climate changes.[14] Climate change is also projected to reduce the availability of surface water, increase the frequency and severity of floods, and prolong dry seasons and droughts. An analysis of water requirements for 35 crops in 81 regions suggests that the economic effects of climate change will be mild until the mid-2030s and then become more severe. The Global Food Security Index ranks Turkey 47th among 113 countries with respect to the overall food security environment. [15] A granular look at the index categories shows that the major risks for Turkey are exposure to droughts and severity of storms. Strategies for enhancing the climate resilience of the agriculture sector need to improve both access and efficient water use. This also includes seizing opportunities for influencing crop patterns towards low-water demand crops in regions facing high water scarcity, and the promotion of water and soil conservation practices in crop production.

12. **Climate change has a major impact on soils/land, accelerating desertification, erosion, causing fertility losses, etc., and vice versa, changes in land use and soils can either accelerate or slow down climate change, as soils are important carbon sinks.** Climate change is one of the main drivers of land degradation through soil erosion, reducing fertility, nutrient depletion, and changing the structure of the soil. Turkey is mostly arid and semi-arid and with rising temperatures and extreme weather events, the risk of land degradation through topsoil erosion is serious. Similarly, organic matter which regulates soil structure and nutrient and water absorption capacity of the soils is also sensitive to rising temperatures and precipitation and its depletion can significantly reduce productivity. Hence, protecting soil health and adopting sustainable soil/land management practices are essential for improved productivity and food security. Moreover, given that soils can also act as carbon sinks preventing soil degradation is an important climate change mitigation strategy. Conservation and proper utilization of soils/land has emerged as a key priority globally[16] and in Turkey, with important regulatory actions taken by the Government of Turkey (GoT) to address issues of soil/land degradation,[17] but also those related to the continued fragmentation of agricultural land,[18] and growing patterns of land abandonment and conversion of fertile agricultural land to non-agricultural uses.[19]

13. **In conjunction with climate change, the expansion and intensification of agriculture and related manufacturing activities are also creating significant environmental and climate pressures**.[20] The agri-food sector is a large (and inefficient) user of land, water, and energy, as well as a large emitter of greenhouse gases (GHGs). Achieving efficiencies

[13] World Bank (2021), Drivers of Food Price Inflation in Turkey (unpublished report).
[14] Demircan et al. (2017). Climate Change Projections for Turkey: Three Models and Two Scenarios. January 2017. Turkish Journal of Water Science and Management 1(1):22-43.
[15] The index is a function of affordability, availability, quality and safety, and natural resources and resilience. Among these categories, Turkey does particularly poorly on affordability and natural resources and resilience.
[16] For example, the EU launched in Nov 2021, the EU Soil Strategy for 2030 Reaping the benefits of healthy soils for people, food, nature and climate. *https://ec.europa.eu/environment/publications/eu-soil-strategy-2030_en.*
[17] A recent study estimates 32% of the country's territory is at high risk of land degradation and desertification, 34% is considered "fragile," and 8% is at "potential" risk (Dengizb, O. & Uzunera, C. (2020). Desertification risk assessment in Turkey based on environmentally sensitive areas. Ecological Indicator 114).
[18] The average farm in Turkey occupies 5.9 ha (as per 2001 census data), compared with 12 ha in the EU and 180 ha in the USA.
[19] In 2005 Turkey issued Law No. 5403 on Soil Preservation and Land Utilization, which sets the rules the rules and principles for determining land and soil resources and their classification, preparing land utilization plans, preventing non-purpose utilization, and defining the tasks and obligations to ensure land and soil preservation.
[20] The Environmental Performance Index (EPI) ranks Turkey the lowest among countries with similar GDP per capita.

in the sector can lead to climate mitigation and low carbon growth:

a. Turkey's agriculture sector is relatively carbon intensive compared with the rest of the economy, with the sector's share of emissions doubling its share in GDP. Turkey's total GHG emissions from agriculture were estimated at 68 million tons of carbon dioxide equivalent (tCO2e) in 2019 representing 13.4% of total country GHG emissions.[21] The annual volume of GHG emissions in the Turkish agricultural sector has continuously increased over the years by 47.7% with reference to 1990. The largest sources of GHG emissions in the agricultural sector are digestive processes and manure from livestock, mainly from cattle.[22]
b. Livestock production has also driven land degradation, given the high intensity of production in Turkey.
c. Agriculture uses majority of the freshwater abstracted in Turkey. Irrigation schemes are mostly open channels and farm irrigation practices (including energy sources) are also inefficient.[23]
d. Fertilizer consumption is growing fast and above the average for OECD countries. Pesticide use is not among the highest in the OECD (and below the world average) but is also increasing fast.[24] Misuse of fertilizers/pesticides, when combined with the mismanagement of land, increases agricultural pollution problems and creates market access challenges.
e. Supply chain inefficiencies translate into high levels of food waste and loss.[25]

14. **Against this background of increasing climate and environmental risks—which threatens to destabilize gains in agricultural productivity, rural incomes and employment, and the resilience of the natural resource base—Turkey has a unique opportunity to pursue a transformation of its agri-food system through repurposing policies and support to the sector.** On the policy front, Turkey has made important progress on prioritizing agriculture climate action as part of the national climate change plans and strategies and aligning national development plans and sectoral programs around such climate change objectives (see Annex 4). In addition, the parliament has recently ratified the Paris Agreement[26], signaling the country's commitment to the global fight against climate change. However, there are opportunities to repurpose public investment support towards further advancing actions highlighted in such policies and global commitments. Agriculture support in Turkey is still highly focused on price support and variable input subsidies. General services support (public services) on the other hand only averaged 17% of all agricultural spending during the period 2017-2019, and the bulk of it (75%) supported irrigation investments. Meanwhile public expenditure on agricultural research, development and innovation (RD&I) averaged only 5%. This is in clear contrast with the EU, where half of the estimated spending under general services go to RD&I, and Brazil, where 92% goes to RD&I.[27] Public support for post-pandemic recovery could be used to transform the sector and build back better, with an emphasis on climate-smart agriculture (CSA)[28] technologies and practices, that deliver multiple wins in terms of agricultural productivity, climate

[21] Greenhouse Gas Emission (GHG) Statistics 1990-2019. *https://data.tuik.gov.tr/Bulten/Index?p=37196&dil=2*.
[22] Turkish Greenhouse Gas Inventory 1990–2018. Inventory Report for submission under the United Nations Framework Convention on Climate Change." Available at: *https://unfccc.int/documents/223580*.
[23] Based on information from the Turkey Modernization Project (P158418).
[24] Consumption of nitrogen fertilizers in Turkey is estimated at almost 5 tones/km^2 of agricultural land and is above the OECD average of 2.7, Pesticide use saw a 28.6% increase over the period 2005-16. OECD (2019), "OECD Environmental Performance Reviews: Turkey 2019." OECD Publishing, Paris. Available at: *https://doi.org/10.1787/9789264309753-en*.
[25] In 2020, the Ministry of Agriculture and Forestry (MoAF) together with the Food and Agriculture Organization of the United Nations (FAO), launched a joint national media campaign "Save Your Food" to raise public awareness about the detrimental impacts of food loss and waste, and to stimulate action along the food supply chain.
[26] The Paris agreement aims to limit the global average temperature rise to "well below" 2 degrees Celsius above pre-industrial levels and "make efforts" to limit it to 1.5 degrees Celsius.
[27] In high agricultural producing countries such as Brazil, 92% of its GSSE goes to innovation, and in Norway, Australia, the EU and Argentina, half of expenditures on general services supports agriculture innovation (OECD, 2020).
[28] Climate-smart agriculture (CSA) is an integrated approach to managing landscapes—cropland, livestock, forests and fisheries—that addresses the interlinked challenges of food security and accelerating climate change. World Bank, April 5, 2021.

resilience and protection of the natural capital of the sector.

15. **CSA technologies and practices can accelerate the sustainable, competitive, and inclusive transformation of the agri-food sector in Turkey.** The mainstreaming of technologies and innovations lies at the core of the transformation of Turkey's agri-food system towards higher levels of competitiveness, sustainability, and climate resilience. Recent broad estimates by the International Finance Corporation (IFC) suggest that the adoption of CSA technologies/approaches in emerging markets in Europe (Russia, Turkey, Ukraine, Serbia) could represent an investment opportunity of US$79.4 billion, and a powerful tool for job creation and GHG emission reduction.[29] These CSA technologies include both traditional practices and nature-based solutions and more modern technologies such as smart and precision agriculture,[30] and energy efficient and waste recycling technologies.

16. **While the range of digital and smart agricultural technologies available in Turkey has been growing rapidly each year, uptake has remained limited**. Digital infrastructure is well established in Turkey, the country has made monumental gains in terms of improving access to digital technologies and services within the last decade.[31] The Ministry of Agriculture and Forestry (MoAF) offers 39 e-services via the E-government Gate.[32] Despite these improvements, there are opportunities to enhance the effectiveness and efficiency of agricultural support via database technologies and advanced analytics. Digital technologies can also play a role in improving agriculture data collection, improving crop and yield forecasting, improving animal health early warning systems and surveillance and overall contribute to narrow information gaps in the sector. The set of digital technologies commercially available in Turkey is growing rapidly but adoption remains low. A recent nationally representative survey conducted by MoAF (TAGEM, 2020, forthcoming) shows that smart and digital technologies were used by less than 3% of interviewed crop farmers. This is below other emerging and advanced agricultural economies including the EU, US, Australia, as well as several countries in Latin America and the former Soviet Union with which Turkey is competing both domestically and on export markets. At the production level, a set of cutting-edge digital technologies has been identified as promising to address issues of ineffective and/or inefficient and unfriendly climate farming systems, including simpler application with great potential among small-scale farmers.[33] Survey results indicate that although farmers are interested in using digital technologies, enhanced adoption, particularly by small-scale producers, will depend on overcoming barriers including lack of knowledge and trust in new technologies and financial constraints. Support to farmers—especially young and women farmers—to disseminate knowledge and build skills are critical to support adoption. Pilots, demonstration plots, public awareness campaigns, and skill development can enable farmers to learn about and use the latest available digital innovations, solutions, and

https://www.worldbank.org/en/topic/climate-smart-agriculture.

[29] Ctrl-Alt-Delete: A Green Reboot for Emerging Markets. Key Sectors for Post-Covid Sustainable Growth. International Finance Corporation (IFC), January 2021.

[30] Smart farming and precision agriculture (PA) are similar concepts. They both refer to the use of digital technologies for improved decision-making in crop and livestock production based on real-time monitoring of a range of relevant parameters and data sources. PA is a farming management concept based upon observing, measuring and responding to inter- and intra-field variability and needs in crops and to variability and needs of individual animals with the use of digital techniques. In some definitions, smart farming is a slightly broader concept that includes PA as well as other decision support tools based on early warning and predictive analytics, as well as automation and robotics.

[31] GSMA (Groupe Spécial Mobile Association)'s Mobile Connectivity Index ranked Turkey 5th out of 150 countries for improvements made to 3G and 4G coverage, network performance, and spectrum availability. Between 2015 and 2017 Turkey climbed five places on the Information Communication Technology Development Index, from 72nd to 67th place. The latest census data from the Ministry of Transport and Infrastructure shows over 80 million mobile telephone subscriptions in the country. As of 2018, 81% of Turkish households had Internet access.
(Turkey: Digital Agriculture Profile (DAP), 2020. Available at: *https://www.fao.org/3/cb3954en/cb3954en.pdf*).

[32] Such as the farmer registration system, the agricultural parcels information service, the livestock identification service, the land consolidation service, the Farm Accountancy Data Network extended to all 81 provinces and integrated into the agricultural production and registration system.

[33] They include short message services (SMS) and interactive voice response (IVR) decision support systems for lower-tech farmers; and for larger farmers computer / smartphone applications for farmer's decision support; sensors and applications for real-time livestock location/health information; Internet of Things and advanced analytics for decision support (Turkey, Digital Agriculture Profile, 2020).

opportunities. The public sector has already laid a strong foundation for digital agriculture,[34] and additional opportunities exist in terms of creating an enabling environment for promoting private sector entrepreneurship and for introducing digital solutions in agriculture, including through co-financing schemes and public-private collaboration.

17. **Spurring Turkey's agri-food sustainable transformation could preserve and enhance trade opportunities, while enhancing sectoral competitiveness.** The EU, Turkey's biggest agri-food trade partner, is promoting climate action through its recently launched Green Deal, which highlights the EU's commitment to tackling climate and environmental challenges and achieving carbon neutrality by 2050. Within the framework of the Green Deal, the EU has adopted a Farm-to-Fork strategy, a Biodiversity strategy, a proposal for a Climate Law, a new action plan for the Circular Economy, and most recently a Soil Strategy 2030, all of which address issues relevant to agri-food systems. Agriculture and rural areas are central to the European Green Deal, and the New Common Agriculture Policy: 2021-2027 will be a key tool in reaching the ambitions of the Farm to Fork and Biodiversity strategies. In August 2021, the GoT released the "Green Deal Action Plan"[35] aimed at contributing to Turkey's transition to a sustainable and resource efficient economy and to respond to the comprehensive changes envisaged by the EU Green Deal. The Plan identifies 81 actions and 32 targets around nine pillars. For sustainable agriculture (pillar 5), the Plan highlights actions in eight thematic areas[36] to be implemented between 2021-2023. For combating climate change (pillar 7), relevant agriculture-related actions include promoting sustainable farming systems, research on carbon sinks, and support to sustainable landscape planning/management. All these actions represent a timely opportunity for Turkey to further modernize the agri-food sector, enhance its competitiveness, and strengthen public-private partnerships and multi-stakeholder alliances as vehicles to pilot approaches and promote innovations.

18. **CSA can contribute to address gender disparities, attract rural youth to farming and strengthen the economic recovery from the pandemic by spurring job creation.** By recognizing that climate change affects women and men differently, CSA can be developed and promoted in a way that addresses existing gender gaps (Box 1) and ensures that men and women can equally benefit from interventions aimed at reducing climate vulnerability and enhancing climate mitigation.[37] In Turkey, investments are needed to strengthen agricultural extension and advisory services, and climate information services to reach both women and men. For example, providing women with equal access to training and services through developing the capacity of service providers so they can create opportunities for women, and reach women and youth with gender and age-appropriate communication channels. Also, institutions need to become aware of women's unique priorities, which presupposes that women's voices are included in decision-making processes. Youth unemployment is also an important issue in Turkey. The Turkish Statistical Institute recently estimated that nearly 25% of individuals ages 15–24 is unemployed. Furthermore, while cities are getting crowded with young unemployed people, the farming population is growing older.[38] Experiences of technology-based agriculture programs in EU and the USA, have

[34] The development and support of smart agricultural technologies, innovative and environmentally friendly production techniques are included in the policies and measures in the 11th Development Plan.

[35] Yeşil Mutabakat Eylem Planı 2021—The Green Deal Action Plan, as per the English translation highlights priority action areas but does not define specific targets to be achieved e.g., in terms of reduction of pesticides or fertilizer use.

[36] The thematic areas include: reducing pesticide and antimicrobial use; (ii) mainstreaming the use of biological and biotechnical controls; (iii) analyzing opportunities for the reduction of the use of chemical fertilizers; (iv) further developing organic production; (v) completing the harmonizing with the EU of the organic agriculture regulation; (vi) carrying out research/studies on the reuse of residues and waste in agricultural production; (vii) consumer awareness on food losses/waste reduction; (viii) supporting awareness creation on the EU's "Farm to Fork" and "Biodiversity strategies."

[37] CSA is more likely to contribute to gender equality, when CSA practices and technologies do not only contribute to sustainable agricultural intensification but are also less time-, labor- and energy-intensive for women. WBG, FAO, and IFAD, 2015. Gender in Climate-Smart Agriculture Module 18 for Gender in Agriculture Sourcebook.

[38] The National Youth Employment Strategy and Action Plan (2021-2023) includes an Action Plan to increase youth employment in rural areas, covering actions around improving knowledge and skills, the implementation of programs based on regional needs and new technologies, and the

demonstrated the potential of digital technologies to support a new generation of young new farmers and provide income opportunities for youth in digital support services.

Box 1: Women in agriculture, barriers to employment and entrepreneurship opportunities

In 2020, it is estimated that about 40% (down from 44% in 2019) of those employed in agriculture are women, but a large proportion of females subsidize their work in the form of unpaid family farm labor.[39] Although female entrepreneurship has been increasing annually in Turkey, and faster than male entrepreneurship, their share of total entrepreneurs is low both across sectors and in agriculture, due to limited access to capital and other financial support, as well as a lack of business skills and experience. [40] Turkey has one of the largest gender gaps in financial inclusion. Specifically, only 54% of women have an account as opposed to 83% of men; and 43% of male-owned Turkish firms report being credit constrained compared to 63% of female-owned firms. This is due to smaller asset basis and higher collateral requirements (as compared with men); indicatively, 58% of loans require collateral when the business is managed by a woman, compared to only 37% when the business is run by a man. A novel loan application experiment showed that bias against women entrepreneurs by lending officers also plays a role on limiting finance opportunities for women.[41] In rural areas, women's access to finance is hampered by additional factors such as their limited mobility and lack of information on modes and costs of finance.[42] Turkey also has a digital gender gap: although 71% of individuals actively use the internet,[43] Turkey's gender gap in internet usage is 16%.[44] The use of mobile phones, however, is almost universal across gender and age groups.[45] A recent analysis by the WB and others on the opportunities for digital agriculture suggests that efforts based on mobile approaches and data analytics are the most likely to bring high-impact solutions to the Turkish agricultural sector, where, as of 2015, only 18.4% of rural women (aged 16 - 74) reported that they used the internet.[46]

19. **Turkey has made good and continued progress on the fight against animal diseases; however, climate change and other pressures are increasing risks of outbreaks.** Extreme weather events and exposure to increased temperatures can adversely affect animal health through heat stress, metabolic disorder, oxidative stress, and immune suppression, resulting in an increased propensity for disease incidence (including of zoonosis diseases) and death.[47] Turkey has borders with countries where many economically important infectious and vector borne diseases are endemic. Climate-related events can create even more favorable conditions for emergence/re-emergence of existing and introduction of new infectious and/or vector-borne animal diseases and zoonoses.[48] Turkey has experienced recent outbreaks including on

development of incentives and new business areas.

[39] Food and Agriculture Organization (FAO), 2016. National Gender Profile of Agricultural and Rural Livelihoods: Turkey.

[40] Only around 15% of all entrepreneurs are women, compared with the EU average of 31%, and 8% of all employers are female. In the agriculture sector women share of entrepreneurs is 14% versus an EU average of 30%). Food and Agriculture Organization (FAO), 2016. National Gender Profile of Agricultural and Rural Livelihoods: Turkey. Country Gender Assessment Series. Available at: *http://www.fao.org/family-farming/detail/en/c/854160/*

[41] Alibhai, S., Donald, A., Goldstein, M., Oguz, A. A., Pankov, A., and Strobbe, F., 2019. Gender Bias in SME Lending; Experimental Evidence from Turkey. World Bank Group: Africa Gender Innovation Lab & Finance, competitiveness, and Innovation Global Practice; and Brock, J.M., and De Haas, R., 2019. Gender discrimination in small business lending. Evidence from a lab-in-the-field experiment in Turkey. European Bank for Reconstruction and Development (EBRD).

[42] Food and Agriculture Organization (FAO). 2016. National Gender Profile of Agricultural and Rural Livelihoods: Turkey.

[43] Turkey: Digital Agricultural Profile, 2020.

[44] Organization for Economic Co-operation and Development (OECD). 2018. Bridging the Digital Gender Divide; Include, Upskill, Innovate.

[45] TurkStat Survey on Information and Communication Technology (ICT) Usage in Households and by Individuals, 2021 released on 26 August 2021. Available at: https://data.tuik.gov.tr/Bulten/Index?p=37437&dil=2

[46] Food and Agriculture Organization (FAO), 2016. National Gender Profile of Agricultural and Rural Livelihoods: Turkey.
Country Gender Assessment Series. Available at: http://www.fao.org/family-farming/detail/en/c/854160/

[47] Ali, M. Z., Carlile, G., & Giasuddin, M. (2020). Impact of global climate change on livestock health: Bangladesh perspective. Open veterinary journal, 10(2), 178–188. Available at: *https://doi.org/10.4314/ovj.v10i2.7*

[48] Duzly, O., Inci, A., Yildirim, A., Doganay, M. (2020). Vector-borne Zoonotic Diseases in Turkey: Rising Threats on Public Health. Turkish Society for Parasitology. 44(3): 168-175. Available at: *https://www.researchgate.net/publication/344280414_*

Peste des Petits Ruminants (997 outbreaks from 1999 to 2018) and lumpy skin disease (180 outbreaks in 2019 and 5 in 2020).[49] The prevalence of other animal diseases in the country includes brucellosis affecting around 1.43% of the animal population[50], tuberculosis, and Foot-and-Mouth Disease. Overall, these diseases are causing significant economic losses in the Turkish livestock sector[51] and can represent important risks to human health. They have become endemic and some of them are controlled through mass vaccination programs which have contributed to a decline in outbreaks and in maintaining disease-free zones particularly in Western Turkey. Enhancing animal disease surveillance through effective notification and laboratory diagnosis and control capacity are a priority in Turkey, particularly given the expected impacts of climate change on increasing the spread, severity, and distribution of pathogens and infectious animal diseases. Effective prevention and control of animal diseases and zoonoses is a key pillar of a climate resilient and safer agricultural sector and key to sustaining poverty and inclusion gains.

20. **In sum, during the post-COVID phase of its economic recovery, Turkey has an unprecedented opportunity to advance its agricultural agenda for climate smart, resilient, and green growth that delivers more and better jobs and income opportunities**. The COVID-19 pandemic was a strong setback to the economic recovery from the 2018 recession. Social assistance measures helped vulnerable populations, including agricultural workers, to survive the crisis, and farmers and agri-food enterprises benefited from credit lines and stimulus packages to ensure that critical agricultural value chains continued to function. In the post-COVID-19 recovery phase, the project activities will contribute to enhancing productive, sustainable, and resilient growth in the agricultural sector, while creating jobs and other livelihood opportunities for farmers and vulnerable populations. The project will help to place the sector onto a climate-smart growth path and prepare the country to take advantage of policy developments in key export markets. It will achieve these aims: (i) by aligning support packages to build the sector's resilience, sustainability, and resource-use efficiency, with an emphasis on inclusion and human capital development; and (ii) by enhancing the GoT's capacity for policy and programming, and effective service delivery in the sector, particularly around the soil and land use agenda, sectoral data, and animal health issues.

C. Relevance to Higher Level Objectives

21. **The project will contribute to Turkey's Eleventh Development Plan, as well as to meeting sectoral objectives set out through a range of recent plans, strategies, programs, and regulatory actions**. These include: (i) objectives set in the Eleventh Development Plan (2019–23) around the creation of an efficient and more competitive agricultural sector that is environmentally, socially, and economically sustainable;[52] (ii) objectives set in the Strategic Plan of MoAF 2019–2023 around the efficient use and protection of the sector's natural capital (soil, land, and water), improvements in input-use efficiency, enhanced information systems in land-use planning and policy decisions, promotion of climate-smart production practices (including digital), and ensuring food and feed safety from production to consumption by improving animal health and welfare; [53] (iii) climate change adaptation objectives for the agriculture sector stated in the Turkey's National Climate Change Adaptation Strategy and Action Plan (2011-2023); (iv) climate change mitigation actions in

[49] *https://efsa.onlinelibrary.wiley.com/doi/pdf/10.2903/j.efsa.2015.3985*

[50] In the Anatolia region for example financial losses caused by FMD are estimated on average of $386 per animal (Lyisan, A.S., et al. Sero-epidemiology of brucellosis on cattle and sheep in Turkey. J Pendik Vet Microbiol 2000;3 1:21-75.*)*. Recent studies on production loss from LSD infection in Turkey are estimated at US$886.34 for dairy cattle and the US$1,066.6 for beef cattle per animal *(https://bmcvetres.biomedcentral.com/articles/10.1186/s12917-021-02983-x*).

[51] *https://www.jscimedcentral.com/Veterinarymedicine/veterinarymedicine-4-1079.pdf*

[52] Presidency of the Republic of Turkey and Presidency of Strategy and Budget (2020). 100th Year Turkey Plan. Eleventh Development Plan (2019–2023). Ankara. [Official English translation.] Available at: *https://www.sbb.gov.tr/wp-content/uploads/2020/06/Eleventh_Development_Plan-2019-2023.pdf*.

[53] Released in September 2020.

agriculture proposed under the Intended National Determined Contributions (INDC) under the UN Framework Convention on Climate Change and Turkey Climate Change Strategy (2010-2023);[54] (v) soil conservation voluntary targets set under the national Land Degradation Neutrality approach the United Nations Convention on Combating Desertification and National Strategy and Action Plan to Combat Desertification (2015-2023); (vi) actions in relation to sustainable agriculture and climate change stated in the Green Deal Action Plan,[55] released by the GoT in August 2021, particularly in relation to expanding the use of biofertilizers, renewable energy use in greenhouse production, and sustainable land use planning; and (vii) objectives around water quality in line with regulations on protection of waters from agriculture nitrate pollution.

22. **The project is aligned with the World Bank Group (WBG) Country Partnership Framework (CPF) for Turkey for FY18–FY21 (Report No. 11096-TR, discussed on August 29, 2017), which was extended to cover the FY22–23 period through the recent Program and Learning Review (PLR) (Report No. 14253-TR, discussed on March 13, 2020).** The project will contribute to revised CPF objective 9 (Strengthened Results Under Climate Action Agenda) under the Sustainability focus area to help Turkey orient growth toward a more resilient and sustainable trajectory. The project will also contribute to CPF objective 5 (Increased Labor Force Participation of Women and Vulnerable Groups) under the Inclusion focus area by supporting income generation and livelihood diversification among vulnerable populations.

23. **The project aligns with priorities identified in the recently released WBG Climate Action Plan 2021–2025 "Supporting Green, Resilient, and Inclusive Development".** Particularly, in relation to accelerating sustainable transitions in priority systems that contribute the most to GHG emissions and facing also significant adaptation challenges, specifically the "agriculture, food, water, and land" system, through support to CSA via policy and technological interventions; and the "energy" system, through support for renewal energy options in agriculture.

24. **The proposed operation reflects the core principles of sustainability and "scaling up selectively for impact" articulated in the WBG COVID-19 Crisis Response Approach Paper**. The project will contribute to Pillar 4 (strengthening policies, institutions, and investments for resilient, inclusive, and sustainable recovery by Rebuilding Better) by helping to preserve agricultural growth-oriented sectors and supporting the transition to more sustainable production processes. Specifically, the project will:

a) Invest in sustainability and climate change adaptation and mitigation in the agricultural sector. The project will apply the CSA approach and will support key elements of capacity around the agenda of soil and land, which are critical to contribute to their sustainable planning and management.
b) Support income opportunities in the agricultural sector. The project will support income opportunities by promoting innovation and technology adoption to achieve cost efficiencies, enhance productivity, and preserve growth-oriented agricultural sectors. The project will also support human capital development among farmers, service providers, including youth and women, through skills training and technical support.
c) Support effective One-Health[56] and food safety systems, through reducing the risks of animal diseases (including zoonotic) by enhancing animal health-related monitoring, laboratory and control capacity, including quality control of veterinary medicines and vaccines production.

[54] Annex 4 presents details on climate change mitigation and adaptation strategies prioritized in Turkey in relation to the agriculture sector.
[55] *Yeşil Mutabakat Eylem Planı 2021*—The Green Deal Action Plan, as per the English translation highlights priority action areas but does not define specific targets to be achieved e.g., in terms of reduction of pesticides or fertilizer use.
[56] The One Health concept, promoting the development of strategies and policies for multi-sectoral involvement in prevention and control of animal and vector-borne diseases and zoonoses is extremely relevant for Turkey, see:
Inci, A., Yildirim, A., Duzly, O., Doganay, M., Aksoy, S. (2016). Tick-Borne Diseases in Turkey: A Review Based on One Health Perspective. PLOS Neglected tropical Diseases. E0005021. *https://doi.org/10.1371/journal.pntd.0005021.*

25. **The project will complement ongoing and planned efforts by the WBG to support resilience in Turkey's agri-food sector and generate livelihood opportunities.** These efforts include water related investments under the Turkey Irrigation Modernization Project (P158418, ongoing) and the Turkey Water Circularity and Efficiency Improvement Project (P174915, planned) mainly by complementing the infrastructure irrigation improvements done under these projects, with soft investments (technology related) to improve water use efficiency; agriculture-related investments to strengthen the resilience and livelihoods of vulnerable communities under the recently approved Turkey Resilient Landscape Integration Project (TULIP) (P172562), by complementing traditional approaches to enhance agriculture performance, with more technology oriented approaches. For the Turkey Land Registration and Cadaster Modernization Project (P106284), which is updating cadaster maps to support a digital cadaster and land registry, the project will provide significantly enhanced land and soil data that can be linked to the cadaster system. The project is to be informed by emerging lessons from the WBG engagement in support of private investments under the Turkey Geothermal Development Project (P151739) and the Turkey Organized Industrial Zones Project (P171645). Lastly, the project will inform activities under the Agricultural Employment Support for Refugees and Turkish Citizens through Enhanced Market Linkages Project (P171543, funded through an EU grant) particularly in relation to addressing skills and knowledge gaps in the agriculture sector.

II. PROJECT DESCRIPTION

A. Project Development Objective

26. The project will be funded by a US$341.27 million IBRD loan. The project will support the agricultural sector in transitioning toward a more sustainable, competitive and climate-smart growth orientation by enhancing capacity in a range of areas, including information generation and dissemination to contribute to sustainable soil and land-use planning/management; agricultural data collection and analysis; and animal health aspects, and by supporting innovation and the use of smart farming/climate-smart technologies and practices by farmers and agricultural enterprises. The project investments are expected to contribute to increased agricultural productivity/ competitiveness, resilience, and sustainability.

PDO Statement

27. The Project Development Objective (PDO) is to strengthen capacity for sustainable and competitive agricultural growth and promote the use of climate-smart agriculture in targeted regions in Turkey.

PDO Level Indicators)

- Land area with integral information to develop sustainable and competitive agricultural land planning/management (Hectare (Ha))
- Increase in the analysis/tests for animal disease diagnosis processed in the upgraded/constructed laboratories (Percentage)
- Farmers adopting Climate-Smart Agricultural (CSA) technologies (Number).

B. Project Components

28. **Component 1: Institutional Capacity Strengthening for Climate-Smart Agriculture Policy, Planning, and Investments** (US$151.5 million IBRD). Activities under this component will support the strengthening of broad sectoral capacity, with a particular focus on narrowing information gaps in relation to Turkey's soil and land natural capital, to enhance its sustainable planning and management. Component activities will also enhance MoAF's digital blueprint for data collection and information management to contribute to effective policy monitoring and programming and support improved decision-making across the agricultural sector.

29. **Subcomponent 1.1: Narrowing information gaps to enhance soil health and land-use planning/management** (US$143.5 million IBRD). The General Directorate of Agricultural Reform (TRGM) under the Department of Soil Conservation and Land Assessment will lead the implementation of this subcomponent. Soil and land use are major contributors to GHG emissions mainly through land use changes and nutrient management. Yet, they also play an important role in climate change mitigation by acting as a carbon sink, through adoption of CSA and the protection and rehabilitation of marginal and degraded lands and forests. Healthy soils are also essential for ensuring resilient production. This subcomponent will support the generation of key information and narrowing of capacity gaps in relation to the governance of Turkey's soils/land natural capital, and specifically to contribute to its sustainable planning and management generating climate co-benefits. Subcomponent 1.1 will finance mainly specialized technical services, investments in equipment, small civil works and computer infrastructure and training. Subcomponent activities will be implemented into the following four sequential output blocks, as follows:

a) *Determination of Soils and Land Resources/Assets.* Detailed soil surveys and analysis will be carried out, followed by the preparation of soil classification maps (1:5000 scale) in approximately 14 million hectares. A national soil archive will be established to preserve soil samples following international standards.
b) *Digital National Profile Soil Database*. Activities will strengthen this database, hosting soil/land profile information and soil threats thematic maps, to improve its functionality and capability.
c) *System and Service Development*. Support will be provided to develop and/or optimize the soil and land information and decision support system in the TAD Portal.[57] Specifically, support will be provided to develop the Soil-land Spatial Data Infrastructure and National Soil & Land Information System. The following subsystems will be developed/optimized under the National Soil and Land information system: (i) National Soil monitoring sub-system for selected soil indicators; (ii) Dynamic Modelling/Mapping subsystem including the identification of soil monitoring sites for periodic monitoring of soil threats, nationally; and (iii) a geospatial Soil Organic Carbon Information sub-system. Support will also be provided for the development of data sharing and use policies aligned with international good practice experience. The systems & services to be supported will contribute to develop and guide sectoral climate change mitigation and adaptation strategies.
d) *Land Use Classifications*. Land classifications will be carried out in 78.3 million hectares to use as the basis for preparing land utilization notes delimitating the Turkish agricultural frontier (agricultural land versus other uses). The subcomponent will also support the development and piloting of a decision support system for crop suitability and land planning.

30. Capacity building activities will be implemented across the above four output activities and will be targeted to generators and users of the soil and land information, including MoAF staff. Awareness campaigns, dissemination and training with specific tools developed by the project will target particularly local provincial governments and provincial

[57] The TAD Portal is a web-based portal for the protection of agricultural lands and plains hosted at TRGM. The focus of the improvements will be on systems linked to the TAP Portal; however, support can also be extended to other relevant soil/land subsystems within MoAF.

Soil Conservation Boards. To facilitate data use by different stakeholders, the subcomponent will support upgrading, developing and/or validating user-friendly applications (e.g., via mobile phone) on soil and land information generated by the project.

31. **Subcomponent 1.2: MoAF digital blueprint for sectoral information collection and management** (US$8 million IBRD). This subcomponent will be led by the General Directorate of Information Technologies (BTGM) in close coordination with TRGM and other General Directorates (GDs) as relevant. Activities will enhance MoAF's capacity for data collection and sectoral information management to support smart climate sectoral policy and planning. The subcomponent will support the development, testing and implementation of improved data collection methods and modelling approaches for monitoring crop production and yields, provide production forecasts and overall contribute to agriculture planning (also considering climate change aspects) for food price monitoring, food security assessments, and other applications. Activities will support stakeholder consultations; analysis of data collection and of modeling approaches implemented by other countries for crop/yield and production forecasting (including application of disrupting technologies); the design and piloting of modelling approaches for Turkey, and the preparation and implementation of a roadmap for the institutionalization of those modelling approaches. Upgrades and integration of current institutional information systems to enhance monitoring of agriculture support programs will also be supported. The subcomponent will finance mainly specialized consulting services, investments in equipment and computer infrastructure, and training.

32. **Component 2: Enhancing animal health capacity for effective disease surveillance, diagnostics and control** (US$81.2 million IBRD). Climate change increases livestock susceptibility to diseases and influences the emergence and proliferation of disease hosts and vectors. Effective animal disease surveillance and diagnostic capabilities along with veterinary medicines and vaccines are needed to prevent or control emerging and re-emerging animal diseases and zoonoses. This component will support MoAF's General Directorate of Food and Control (GKGM) on strengthening these important public functions. The component will support strengthening the capacity of Veterinary Control Institutes (VCIs) and the establishment of the National Veterinary Medicinal Control Center. The component will follow best practice (i.e., World Organization for Animal Health, EU) to support feasibility assessments, laboratory facilities, laboratory equipment, technical training for staff (as per the National Reference Laboratory defined plans for all laboratories), and information systems. Designs to maximize green and resilient (e.g., energy saving, seismic resistance) elements in infrastructure and equipment will be considered in the feasibility assessment.

33. **Subcomponent 2.1: Strengthening the capacity of animal health institutes** (US$31.2 million IBRD). The subcomponent will strengthen capacity of the GKGM to deal with introduction and spread of animal diseases and zoonoses due to climate and non-climate related factors via improvements in capacity for animal disease surveillance and diagnostics for infectious and vector-borne diseases. Investments will support biosafety laboratory infrastructure, information systems and capacity building of MoAF's network of VCIs located in the provinces of Adana, Elazig, Erzurum, Konya, Samsun, Izmir, and Istanbul. VCIs provide key services on animal disease diagnostics, analysis, research, and training, and serve also as national reference services for specific animal diseases. The project will specifically support upgrades to the institutes' infrastructure to increase the biosafety level (BSL) of laboratory units from BSL1 to BSL2 and BSL3, through investments in critical construction works, equipment, and biosecurity trainings, certification, as well as the establishment of a common laboratory information management system for the targeted institutes. A detailed needs assessment and analysis of upgrades required will be undertaken during the first year of project implementation. The project will also support the development of a national animal-health laboratory policy.

34. **Subcomponent 2.2: Strengthening and improving veterinary medicinal product controls for animal infectious**

and vector-borne diseases and zoonoses (US$50.0 million IBRD). Effective disease controls are critical to reduce the proliferation and resurgence of animal diseases, exacerbated by climate change. This subcomponent will support activities to improve the capacity of Turkey to control and regulate veterinary medicines and vaccines to ensure that effective and high-quality products reach the market. It will do so by supporting the establishment of a centralized Veterinary Medicinal Control Center, bringing together the functions that are now disaggregated in two different veterinary institutes and enable in-country veterinary medicine/vaccine efficacy and safety tests which are currently carried out abroad and are costly. The project will invest in construction works, equipment, and technical services to build: (i) testing, analyses, and administrative facilities; (ii) a national vaccine strain collection lab (BSL2/BSL3); and (iii) experimental laboratory units (BSL2/BSL3). Activities will also support capacity building and training (also covering climate-related topics as appropriate), certification and some operational costs. The new center is expected to become self-sustaining over time through the provision of fee for services to the veterinary medical product sector i.e. manufactures, importers, exporters etc. A detailed need analysis and feasibility assessment and business planning will be undertaken during the first year of project implementation, analyzing issues of location, technical design, cost and sustainability; and environmental and social risks and mitigation options. Visits by MoAF staff to international reference centers will also inform the assessment.

35. **Component 3: Investments for Enhanced Productivity, Resource-Efficiency, and Climate Resilience** (US$99.75 million IBRD, US$33 million Beneficiaries). This component will support the dissemination, validation and adoption of CSA technologies and practices, as well as RD&I efforts. The adoption of CSA technologies and practices will contribute to improved agriculture performance via productivity gains, cost reductions, more efficient resource-use (fertilizers, pesticides, energy, water) and improved climate resilience, while generating also important climate mitigation benefits and reducing pollution. Investments under this component are also expected to generate key agricultural data to support decision making by farmers and enterprises and to inform policy design. The component will encourage the uptake and effective use of innovative/disruptive CSA technologies/practices by closing knowledge and skill gaps and by providing financial support and technical assistance to producers and enterprises. Activities supported under Component 3 will be implemented through four subcomponents.

36. **Subcomponent 3.1: Strengthening climate resilience, productivity, and resource-use efficiency in horticultural production** (US$30 million IBRD). Price and supply fluctuations are a recurrent problem in Turkey's horticultural production (particularly of vegetables) due to several factors, with climate-related factors playing an increasingly important role. Protected agriculture, through the establishment of greenhouse production has been a priority in Turkey in the past decade, particularly for highly climate sensitive crops such as vegetables. In most recent years, the government has committed to increase the energy and overall efficiency of greenhouse production. Geothermal energy in modern, technology-based greenhouses can replace fossil fuel, reducing energy costs, energy consumption, and the environmental footprint of greenhouses. MoAF is operationalizing clustered investments in geothermal-based greenhouse infrastructure under the Specialized Organized Industrial Zone Based on Agriculture—(Tarıma Dayalı İhtisas Organize Sanayi Bölgesi—TDİOSB), specifically those specializing on greenhouse investments (geothermally sourced). Subcomponent 3.1 will pilot a geothermal greenhouse business model to build basic infrastructure in TDİOSB, and mobilize private (including small/middle size) investors rapidly, to build greenhouse infrastructure (supra-infrastructure), while maintaining the advantages of a cluster. The model will be piloted in one or potentially two TDİOSB sites depending on final cost assessments, selected from among the 14 sites where feasibility studies have already been undertaken by the MoAF. Funds will cover consulting services for zone planning and geological surveys; works on basic enabling infrastructure (civil infrastructure and construction works such as: geothermal drilling, geothermal heating power production facility; energy transmission line and network backup power line as well as an electrical substation; potable and utility water reservoirs and pumping stations; telecommunication center; foundation drainage connection line; gas

supply, local roads; etc.); studies and feasibility analysis of different investment models and investment needs; and dissemination and outreach activities to target collaboration with the private sector. The implementation of the subcomponent will follow a phased approach, with gradual implementation of basic infrastructure investments. The TRGM under the Department of Organized Agriculture and Livestock Zones, will lead the implementation of these activities in close coordination with the selected TDİOSBs (see Annexes 1 and 2 for details).

37. **Subcomponent 3.2: Promoting the adoption of CSA technologies/practices** (US$40 million IBRD, US$33 million Beneficiaries). This subcomponent will be implemented by TRGM and will focus on expanding the use of emerging innovative/disruptive CSA and energy-efficient technologies on small and medium farms to enhance the productivity and profitability of farm operations, increase input-efficiencies and reduce carbon footprint and other negative environmental impacts. This subcomponent will primarily focus on awareness creation, dissemination and providing co-funding opportunities for digitally enabled technologies and solutions (smart and precision agriculture). Activities will focus on demonstrating and innovating, with careful attention paid to assure replicability and inform policies.

38. Activities will support awareness & dissemination and specific investment to support acquisition of digital CSA technologies[58] suitable for small and medium farm enterprises that are commercially available in Turkey. The project will support the cost of acquiring digitally enabled technologies, equipment/machinery and related goods, license fees for remote sensing and cloud-based analytical services, training and specialized consulting services. A matching grant (cost-sharing) mechanism will be established, with separate windows targeting producer organizations, agribusinesses promoting contract farming, and private service providers targeting small and medium farm enterprises. Special attention will be paid to using gender appropriate communication channels to reach women to address constraints on accessing agriculture advisory services and support. Increased access to CSA digital technologies will contribute to lowering the use of fertilizers, pesticides, water, and energy and to stabilize or increase yields thereby supporting climate change adaptation and mitigation. The subcomponent will also support generalized training activities to create awareness and disseminate knowledge among farmers, extension workers from the public and private sectors, and other relevant stakeholders. It will also strengthen TRGM's capacity to deliver training, via the establishment of a training hub. Local stakeholder engagement, sensitization about digital CSAs, as well as related training and capacity building will be implemented in close collaboration with technology providers, universities and other relevant entities complementing the grant program.

39. **Subcomponent 3.3: Reducing animal production pressures on water pollution and GHG emissions** (US$15 million IBRD). Subcomponent activities will be implemented by TRGM under the Department of Protection of Agricultural Environment and Natural Resources. Activities will pilot and promote innovative approaches for manure management to overcome existing knowledge, physical and logistical barriers. Activities will support establishment of stakeholder information network around manure management experience and knowledge; training of professionals on manure management services; a pilot for encouraging third-party manure collection and biofertilizer processing, potentially linked to biogas generation, and policy analysis. It will also support awareness and training on other sources of water pollution linked to fertilizers use in pastures and feed crops. The subcomponent will finance construction works and equipment, equipment for transportation and application of biofertilizer in fields, training and demonstrations and specialized consulting services. The subcomponent will focus on the Küçük Menderes and the Gediz basins (in the Aegean region), which cover sub-basins identified by MoAF as Nitrate Vulnerable Zones. It will focus on areas where there is a significant presence of medium/large sized livestock farms and a lack of proper manure collection/storage facilities[59] in

[58] Precision farming and regenerative or conservation agriculture are key entry points for the promotion of CSA highlighted by the World Bank Climate Change Strategy 2021-2025 (Transition sector: Agriculture, Food, Water and Land).

[59] The agriculture sector (mainly from livestock) contributes 62.4% of the total methane emissions in Turkey; the share of methane alone in total

compliance with Good Agriculture Practice (GAP) Code.

40. **Subcomponent 3.4: Research and innovations to support CSA** (US$14.75 million IBRD). Activities under this subcomponent will be implemented by TAGEM and will support the implementation of the RD&I agenda around CSA. The subcomponent will support research, validation and dissemination efforts around Integrated Pest Management, especially biological and biotechnical control methods, microbial pesticide, and identification of new resistant lines and cultivars against soil-borne pathogens in order to reduce the effects of pesticides on the environment and human health and to prevent economic losses. A particular focus will be given to some export crops facing market access challenges due to pesticides (e.g. citrus), as well as other crops (e.g. wheat, potato, corn). The subcomponent will also support the expanding use of biofertilizers (particularly around legume crops) to enhance fertilizer management and reduce the use of chemical fertilizers. Subcomponent activities will also cover climate-related dissemination activities around energy-saving technologies produced by TAGEM (e.g. solar milking prototype); and carrying out climate assessments to create awareness around climate impacts in crops, and on the opportunities for reducing the water and carbon footprint of key priority value chains and optimize crop planning (e.g. based on water needs). The subcomponent activities will also include purchasing and installing new equipment for the research institutes and small-scale civil works for refurbishing their existing facilities. TAGEM's RD&I efforts will include considerations of women's needs and unique priorities when generating, validating and dissemination CSA technologies. The subcomponent activities will contribute positively to mitigation by generating and/or disseminating alternative products/practices (integrated pest management, biopesticides, solar-energy powered machinery).

41. **Component 4: Project Management, Monitoring, and Evaluation** (US$8.65 million IBRD). Activities under this component will support all project management functions. It will include support for a Project Coordination Unit (PCU) at the General Directorate of EU and Foreign Relations (ABDGM), and Project Implementation Units (PIUs) under TRGM, TAGEM, BTGM and GKGM, for: (i) strengthening capacity for day-to-day project management of technical, fiduciary, Monitoring and Evaluation (M&E), Environmental and Social (E&S) issues; (ii) grievance redress, citizen engagement, and implementation of the communications; and (iii) M&E of project activities, including impact assessments, beneficiary satisfaction surveys, and development of an integrated system for project management and monitoring of project outputs and outcomes.

42. **Gender.** The project will focus on addressing three key gender gaps: (i) inequality in the participation of women in targeted trainings and agricultural advisory support services; (ii) access to financial products; and (iii) the lack of gender disaggregated data availability for analysis and policymaking. Additionally, interventions supported by the project will contribute, indirectly, to enhancing working conditions for women and overall to reducing gender stereotypes in the agriculture sector, including access to financial support and services. These activities are in line with the WBG Gender Strategy (2016 – 2023) objectives of *Removing Constraints for More and Better Jobs, Removing Barriers to Women's Ownership of and Control over Assets* and *Enhancing Women's Voice and Agency and Engaging Men and Boys.*[60] For the first gender gap, the project, particularly through Component 3 activities, will assess and address the needs of women producers, agri-entrepreneurs, and service providers on targeted training and/or advisory services. Through participatory discussions women's feedback will be collected to inform training design and mechanisms for service delivery, to improve women outreach. Participatory discussions will be planned considering women's schedules and other responsibilities to ensure maximum participation. Also, women-focused outreach activities will be conducted to ensure broad awareness

agriculture emissions in Turkey is 13%. Methane is a powerful greenhouses gas with a 100-year global warming potential 28-34 times that of CO2. Measured over a 20-year period, that ratio grows to 84-86 times.

[60] World Bank Group. 2015. World Bank Group Gender Strategy (FY16-23): Gender Equality, Poverty Reduction and Inclusive Growth. Available at: *https://openknowledge.worldbank.org/handle/10986/23425*.

and dissemination around the opportunities and benefits to women generated from their engagement in project activities. The project will reach out with information and awareness raising campaigns (on services offered by the project) to women farmers and agri-entrepreneurs through means that are accessible to women. Given the high penetration of mobile telephones, especially for women, the project will explore disseminating information through text messages including for easy feedback and for survey tools. In addition, the project will adopt a number of measures to support women's active participation more broadly, including selecting service providers with proven experience/capacity working with women; and hold separate sessions with women to ascertain their opinions and needs. The project will also contribute to reducing gender biases in agriculture by incorporating, in extension and capacity building services, messages that do not confine women to defined gender roles and social expectations.

43. To address the gap in terms of women accessing financial products (largely due to gender bias-decision by financial institutions),[61] for the grant programs supported under Component 3, the project will include eligibility/ evaluation criteria of grant applications to benefit women's participation (such as producer organizations that include women in their board or as beneficiary members, etc.). The indicator *Women benefiting from financing support provided by the project* (Number) is suggested to track progress against closing this gender gap. In addition, the project will disaggregate other relevant indicators by gender, namely: Farmers adopting Climate- Smart Agricultural (CSA) technologies (Number); Farmers trained on the application of CSA technologies and practices (Number); and Extension staff/service providers trained on the use of CSA technologies and practices (Number).

44. The project will contribute to address gaps in terms of gender-disaggregated data for policy analysis (the third gender gap), through project M&E activities embedded in the implementation of subcomponents (e.g. survey baselines), as well as within the overall M&E under Component 4. Disaggregated data collected by the project and assessment reports commissioned by the project will contribute to understanding gender-specific constraints and will inform opportunities for designing gender-centered policy interventions. Subcomponent 3.4 on RD&I on CSA will promote the generation, adaptation, and dissemination of gender-inclusive technologies, such as the dairy milking technology powered with solar energy, which facilitate milking processes often carried out by women. Although no sex-disaggregated data is available on the greenhouse industry, it is widely reported that the majority of the labor force in greenhouse production is made of women.[62] The expansion of greenhouse infrastructure investments as well as the expected reduction in potential health threats in the workplace through, e.g. integrated pest management, are expected to generate more labor opportunities for women and indirectly contribute to improved working conditions for women (and men) in greenhouses.

45. **Climate change.** Project activities are strongly aligned with improved climate outcomes and the National Development and Climate Action Plans, both in terms of mitigation and adaptation. The activities financed under the project aim to address a range of sector climate-related challenges and opportunities, such as vulnerability to climate change, natural resource degradation, resource-use efficiency, innovation and technology adoption to achieve low carbon growth, and enhancement of soil carbon sinks. To address these challenges/opportunities the project will invest in activities related to capacity building, farmer education and training, digital technology, incentives and research and innovation. The project is expected to generate significant climate co-benefits by promoting a range of activities that will enhance the adaptation and mitigation capacity of farming systems in Turkey (see Annex 4 for details).

[61] Alibhai, S., Donald, A., Goldstein, M., Oguz, A.A., Pankov, A., and Strobbe, F. 2019. Gender Bias in SME Lending; Experimental Evidence from Turkey. World Bank Group: Africa Gender Innovation Lab & Finance, Competitiveness and Innovation Global Practice; and Brock, J.M., and De Haas, R. 2019. Gender discrimination in small business lending. Evidence from a lab-in-the-field experiment in Turkey. European Bank for Reconstruction and Development (EBRD).

[62] Food and Agriculture Organization (FAO). 2016. National Gender Profile of Agricultural and Rural Livelihoods: Turkey.

46. **Land is both a source and a sink of GHGs.** Sustainable land management can contribute to reducing the negative impacts of climate change on ecosystems and societies. Component 1 will support (i) protection and conservation of soils and lands by strengthening national capacity around determining and monitoring soil health, and (ii) the protection of agricultural land and its sustainable use, which are intrinsic to the climate change agenda. By determining soil types/classifications and producing maps and dynamic monitoring systems for soil threats (soil erosion, organic matter, desertification, salinity, etc.), the project will contribute critical information to inform climate policies and support decision making processes. The mapping of carbon sinks as well as the soil threats (erosion, salinization, etc.) and the production of dynamic models that monitor their changes over time is a critical tool for the assessment of climate change impacts and fulfill international reporting requirements. Land use classifications will inform a set of policies around conservation of agricultural lands and their sustainable use. This will inform practices that improve soil health through efficient nutrient management, changes in crop patterns that are aligned with climate change and reducing pressure on non-agricultural by improving productivity and sustainability of current agricultural lands. Component 1 will also support the development and piloting of methodologies for crop and yield forecasting (including incorporating climate data).

47. While livestock is a major contributor to climate change worldwide, as 14.5% of all human-caused GHG emissions come from livestock supply chains,[63] it is also extremely vulnerable to it. Increasing temperatures and variability in rainfall impact animal health by causing metabolic disruptions, oxidative stress, and immune suppression causing infections and death. Moreover, they also lead to new diseases, and alter the distribution, survival, and transmission of pathogens, parasites, and vectors. Disease surveillance systems can play an integral role in preventing spread of diseases through early detection as well as improving mitigation and adaptation responses of animals to climate change. Component 2 will focus on enhancing capacity for early detection and effective animal disease surveillance and diagnostics and control of animal diseases and zoonoses and official regulation of veterinary medicines/vaccines. The epidemiology and adaptation capacity of climate-sensitive animal diseases and zoonoses in Turkey is highly affected by climate change[64,65] and climate-environmental dynamics due to complex interaction between animal, wildlife and human hosts, vectors and pathogens which drive diseases geographical spread and seasonal trends. Laboratory capacity and capability is fundamental in timely diagnosing and tracking these diseases and engagement in interdisciplinary research and development to support effective and efficient policies on disease prevention and control and their implementation. The project will specifically invest in critical construction work (following national and international good practice in relation to green and resilient building infrastructure), and equipment needs (focusing on high energy-saving equipment). Therefore, activities in this component contribute to agriculture climate change adaptation, increased resilience, and One Health approach efforts.

48. Component 3 will contribute to climate change mitigation through: (i) better manure management; (ii) validating and mainstreaming productive uses of renewable and energy efficient technologies (geothermal); (iii) supporting technologies displacing use of chemical fertilizers and pesticides; and (iv) supporting digital technologies that increase the effectiveness of input use contributing to reducing emissions. In terms of adaptation, the project will support climate assessments to understand climate impacts and adaptation strategies. Promotion of geothermal infrastructure for direct energy use in greenhouse production contributes to the expansion of renewable energy and displacement of fossil fuels. Component 3 will also support applied research on CSA practices, integrated pest management (IPM), precision agriculture, and adoption of GAP through extension services. These public programs will promote both mitigation of and adaptation to climate change and will scale up CSA.

[63] FAO (2016). *https://www.fao.org/3/i6345e/i6345e.pdf*
[64] Abdela, N., & Jilo, K. (2016). Impact of climate change on livestock health: A review. Global Veterinaria, 16(5), 419-424.
[65] Duzly, O., Inci, A., Yildirim, A., Doganay, M. (2020). Vector-borne Zoonotic Diseases in Turkey: Rising Threats on Public Health. Turkish Society for Parasitology. 44(3): 168-175. *DOI:10.4274/tpd.galenos.2020.6985* (Available at: *https://www.researchgate.net/publication/344280414_Vector-borne_Zoonotic_Diseases_in_Turkey_Rising_Threats_on_Public_Health*

49. By supporting measures that will help farmers mitigate and increase their adaptive capacity and resilience to climate change the project will contribute to Turkey's National Development and Climate Action Plans asrelevant to the agricultural sector. Project activities will contribute towards its INDC goals both in terms of adaptation as well as mitigation. Under all components, the infrastructure, including buildings, laboratories, offices, storage facilities etc., constructed and rehabilitated by the project, will be encouraged to utilize energy-efficient and climate-resilient materials and designs, and all activities related to human resource development will include topics on climate change frameworks, tools and techniques to facilitate designing and implementing climate adaptation and mitigation approaches. The project results framework includes a set of climate-related indicators.

50. **GHG accounting.** The Ex-Ante Carbon-balance Tool (EX-ACT) was applied to estimate the GHG impact of agricultural activities supported by the operation. The analysis measured the potential GHG impact generated from: (i) protecting fertile agricultural land from conversion to non-agriculture uses as result of the soil analysis and preparation of land use planning notes; (ii) enhancement of animal health to reduce productivity losses; (iii) reduction of agricultural inputs from investment in subproject on geothermal pilot, digital agriculture technologies; and (iv) reduction of GHG from manure management technologies. The results indicate that over the project lifetime of 20 years, the project reduces/avoids around 5.88 million tCO2-eq. The annualized carbon reduction/avoidance is estimated at 294,350 tCO2-eq per year. A detailed GHG Accounting is available in Annex 4.

51. **Private Sector.** Project investments will promote generation and dissemination of knowledge and information and support RD&I, which are globally accepted as public goods. Project investments will also address market failures such as the lack of information, inclusion, and coordination among market actors and the lack of long-term financing suitable for farmers and agribusinesses. Furthermore, the project will incorporate the WBG's Private Capital Mobilization (PCM) approach by actively crowding-in up to an estimated US$33 million of private finance (from project beneficiaries) to co-share the costs of technology investments. The project will pilot an alternative geothermal greenhouse business model to build infrastructure and mobilize private investors, leveraging the power of the private sector to enhance the climate resiliency of the sector. The project will work through farmer organizations and agri-business to achieve economies of scale in service provision. Through collaboration with private technology providers, for training and technical assistance programs, and the establishment of innovation platforms, the project will open opportunities for scaling-up technology solutions, leveling the playing field for small and middle-scale farmers. These private solutions will have sufficient scale and sustainability to make a lasting impact.

52. **Citizen engagement.** The project will develop and implement a Citizen Engagement (CE) strategy that will be included in the Project Operations Manual (POM). The CE strategy will be designed to solicit unrestricted feedback actively and regularly through multiple channels from citizens and project beneficiaries on project activities as well as the CE process itself. Overall, throughout implementation, the project will consult with providers and users of CSA technologies/practices to inform subcomponents' activities. CE mechanisms will be developed and implemented throughout the project components. Under Component 1: (i) focus groups will pro-actively engage with farmers to develop and validate user-friendly applications in a participatory manner; and (ii) a decision support tool to guide land planning processes at the provincial level will be designed, anchored on solid data and stakeholder engagement. Under Component 2: (iii) the demand assessment of laboratory infrastructure, to ensure sustainability, will include feedback from farmers and other value chain stakeholders, as relevant. Under Component 3: (iv) participatory decision-making and monitoring of the matching grant system (digital CSA technologies) will be ensured. Farmers and farmers associations will be invited to regular roundtables to provide feedback to the design, accessibility, and application processes of the matching grant systems (particularly women and youth) and to prioritize the technologies that will help to address key problems. Other relevant value chain stakeholders, including buyers, processors, service and technology providers will

also be consulted. The planned web-based platform providing a one-stop shop for smart and precision agriculture solutions will also facilitate engagement between farmers and service providers and enable continuous opportunities for structured engagement with farmers through different COVID restrictions. The platform will also be used for sharing information and data, posting results of the surveys, focus groups and working groups, perceptions on the benefits of the technologies, and communicate results of grant program adjustments, etc. Under Component 4: (v) a beneficiary feedback survey will be implemented every two years; (vi) the annual information campaigns for beneficiary engagement in the matching-grant program will serve as a mechanism to inform potential beneficiaries of the requirements for participation and specification of the matching-grant program, including measures taken, as results of beneficiary feedback, to enhance the effectiveness of the matching grant program; and (vii) training for government officials on citizen engagement and response to beneficiaries' needs will be organized, if the need is identified during implementation. The project's SEP will reflect all citizen engagement mechanisms and outline actions for enhancing multistakeholder dialogue and inclusion throughout the project cycle. The project results framework includes an indicator to measure improvement in the CE process.

C. Project Beneficiaries

53. The beneficiaries of the project are famers and supply chain actors, service providers, decision makers and overall rural populations nationally and across targeted regions in Turkey. A total of 81,000 people (out of which about 25,000 are women) will benefit directly from awareness creation, knowledge dissemination/validation around CSA technologies, while about 55,000 largely small and middle scale farmers will benefit from access to technologies/improved resilience infrastructure via co-financed investments. Approximately 3,270 service providers and extension workers will benefit from a wide range of skills development, knowledge and experience sharing activities including through digital platforms. About 5,250 veterinarians, para-veterinarians and laboratory staff will benefit from training about improved diagnostic and surveillance capacity for animal diseases and zoonoses.

54. Beyond these direct beneficiaries, the project is expected to have broader impacts across Turkey. While the main direct beneficiary for information generated and capacity created on soils will be the MoAF staff at national and provincial levels, as well as government authorities in local municipalities/provinces (specifically the Soil Preservation Boards operating in all 81 provinces of Turkey and with responsibilities in agriculture soil protection and conservation),[66] the range of beneficiaries is wider and includes professionals from academia, private sector investors, and farmers, as well as others outside the sector (e.g. urban planning agencies, cadaster, etc.). Improved agriculture data and crop/yield forecasting models will contribute to improved sectoral policy and programming by MoAF and other relevant planning agencies, yet users of the information generated to support decision making process cover stakeholders from farm to fork.

55. Project activities are expected to contribute to sustained long-term sectoral growth, provide job opportunities for local youth, contribute to preventing out-migration, and ultimately contribute to shared prosperity in rural areas. A more sustainable, competitive, and climate-smart agriculture sector will provide many beneficial ecosystem services, including soil biodiversity, carbon capture, reduced emissions, and reduced pollution of water, while reducing vulnerabilities to climate shocks. Reducing inputs such as pesticides will provide benefits to local consumers and those in Turkey's key

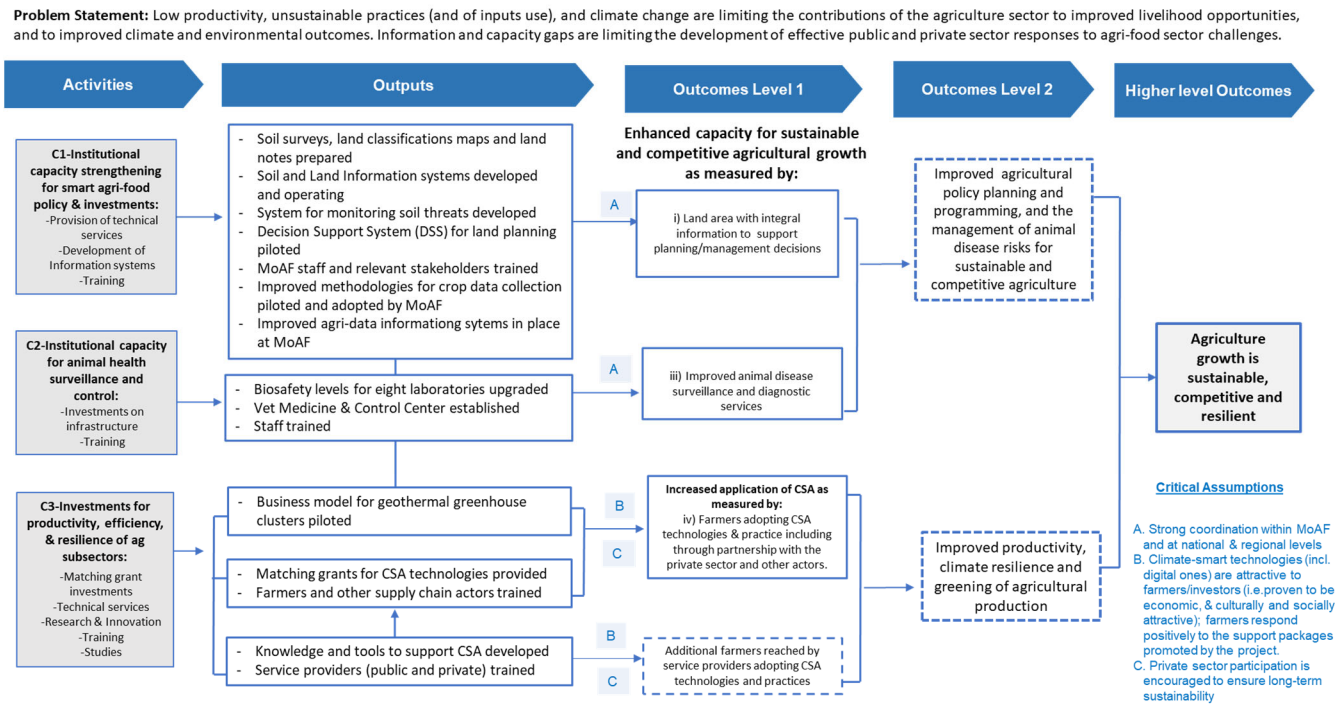
[66] Responsibilities of the Boards as per the law include: (i) screen, evaluate and investigate issues regarding the protection of cultivated areas, to take necessary measures to resolve problems regarding soil protection; (ii) direct all initiatives requiring land use, to review and approve projects aimed to improve land; (iii) follow and evaluate implementation of soil protection measures at the local level; (iv) monitor compliance between national, regional and local plans; and (v) receive requests for the use of cultivated lands and pass these to the relevant authorities, with the Board's opinion.

export markets. Overall, Turkey will benefit from better integration with its main trade partner, the EU, via stronger alignment around the principles of a green and more climate resilient and sustainable agriculture sector. The detection and improved diagnostic of animal diseases (including zoonosis diseases) benefit producer and value chain actors linked to animal production, including the large numbers of small-scale livestock producers, through enhanced resilience of production and supply chains. The associated human health benefits of improved animal disease prevention and control extend more broadly to the overall population in Turkey and in neighboring countries. The private sector will benefit from improved oversight on veterinary medicines/vaccines products and consumers will benefit from improved confidence on the safety of the animal-related food in the market.

D. Results Chain

56. **Theory of Change and Project Design**. Low agricultural productivity, increasingly high input costs, unsustainable production practices/intensification (including unsustainable input use), and climate change are limiting the agri-food sector's contributions to improved livelihood opportunities; improved environmental outcomes; and climate resilience. At the same time, information and capacity gaps are limiting the development of effective public and private sector responses to productivity, sustainability, and climate-related challenges in the agri-food sector. The project will contribute to address those challenges through supporting interventions around: (i) strengthening capacity for sustainable and competitive agricultural growth; and (ii) promoting innovations, technology dissemination and research around CSA. Figure 1 below illustrates the project's Theory of Change.

Figure 1: Theory of Change of the Project



57. The project will align interventions at three levels: (i) *broad capacity-enabling factors,* generating broad sectoral impacts; (ii) *the ecosystem for innovation and service provision* to support the further scaling-up of CSA technologies and practices and ensure sustainability of investments; and (iii) *direct on-farm investments and services* around CSA. Level (i) interventions set the ground for improved decision making across the sector, and in the mid-term more effective policy,

programming, and improved delivery of key public services. Levels (ii) and (iii) set the ground for increased application of CSA technologies and practices. The set of project interrelated investments at the three levels are expected to contribute, in the long term, to sustainable, competitive, and resilient agricultural growth.

E. Rationale for Bank Involvement and Role of Partners

58. **The WB has accumulated significant global experience through its efforts to scale up CSA worldwide**. In 2020, 52% of WB financing in agriculture targeted climate adaption and mitigation. The range of projects financing climate-smart solutions for agriculture has contributed lessons that are highly relevant for Turkey. The WB has also developed a range of alliances with global institutions such as the Food and Agriculture Organization (FAO) and the Consultative Group on International Agricultural Research (CGIAR). The CGIAR develops climate-smart technologies and management methods, early warning and forecasting systems, risk insurance, and other innovations that promote resilience, combat climate change; these efforts could provide useful applications for Turkey. FAO has also developed a strong partnership with MoAF, to build capacity around the soil and land agenda and the digitalization of agriculture, playing a pivotal complementary role to the investments under the WB-funded project.

59. **Given the innovative nature of the project, the WB can play a key role in sourcing global knowledge and experience to inform the use of climate-smart digital innovations in Turkey**. These relevant experiences and knowledge cover:

- **WB's Agriculture and Food Global Practice is becoming a leader on supporting agriculture digitalization**, and has consolidated important emerging knowledge through global reports such as *What's Cooking: Digital Transformation of the Agrifood System; Harnessing Digital Technologies to Improve Food System Outcomes; and the Data-driven Digital Agriculture: Knowledge and Learning Platform,* which has consolidated and disseminated experience and learnings from a wide range of digital agriculture experiences worldwide. The WB's Agriculture and Food Global Practice, together with FAO and CGIAR, has also produced digital agriculture diagnostics in selected countries, including in Turkey, and is increasingly promoting partnerships with private sector, foundations, incubators and accelerators to catalyze opportunities around the digitalization of agriculture.
- **The WB has also developed substantial experience, globally and in Turkey, with renewable energy.** The Bank's long-term engagement with the GoT to support the energy transition offers good lessons for the project, particularly with respect to the planned activities on geothermal energy.
- **The WB has worked for over a decade, in partnership with international organizations (FAO, OIE), to promote and operationalize One Health approaches that recognize the interlinkages between animal health, human health, and the environment**. The WB's knowledge base on the topic includes a wide range of publications[67] and operations, including leading the successful Global Program for Avian Influenza Control and Human Pandemic Preparedness and Response in the mid-2000s (which included Turkey).[68] The WB invests about US$1.5 billion on One Health in operations, including livestock and agriculture projects that include One Health approaches. Based in its knowledge and experience, working closely with international partners, the WB is well positioned to support

[67] People, Pathogens, and Our Planet; the Investing in Climate Change and Health series; the One Health Operational Framework; From panic and neglect to investing in health security: Financing pandemic preparedness at a national level; and Pulling Together to Beat Superbugs: Knowledge and Implementation Gaps in Addressing Antimicrobial Resistance, among other publications.

[68] The most recent WB preliminary report looking at new and emerging diseases makes it very clear that the possibility of "*even much smaller outbreaks can cause significant loss of life and immense economies disruption*" and that current and different public and private sector financial mechanisms can be effectively developed to mitigate potential losses to lives, production and economy by strategically planned investments in different socio-economic context. World Bank, (2017). From Panic and Neglect to Investing in Health Security: Financing Pandemic Preparedness at a National Level. International Working Group on Financing preparedness, Conference Edition. Available at: *https://documents1.worldbank.org/curated/en/979591495652724770/pdf/115271-REVISED-FINAL-IWG-Report-3-5-18.pdf*

investments in long-term systems that improve animal health and wellbeing, while tracking of animal and zoonotic diseases at the source.

F. Lessons Learned and Reflected in the Project Design

60. The project design incorporates important lessons captured from the implementation of related WB-financed projects in Turkey and worldwide and also through the robust global knowledge agenda on CSA and digital agriculture led by the WB's Agriculture and Food Global Practice. The following lessons learned have been reflected in project design.

- In terms of the **adoption of digital technologies** (including smart and precision agriculture), lessons from the global knowledge agenda led by the WB, as well as from studies/surveys undertaken in Turkey[69] that have been applied to the project design include:
  - ***Unleashing the promise of digital technologies in agriculture to improve food system outcomes requires careful policy-making and complementary investments, including investing in institutional innovation to create networks of stakeholders***. These networks are channels for sharing knowledge that support building experience in scaling technology while strengthening public-private partnership and links users to technology providers, generating market opportunities and attracting technology players.
  - ***The promotion of smart and precision agriculture technologies needs to take a holistic approach.*** Despite the benefits of smart and precision agriculture technologies, a number of barriers to adoption need to be addressed. High investment costs, limited knowledge and uncertainties about the benefits of these technologies - real or perceived – are important barriers to adoption, exacerbated by small farm size and advanced age of farmers. Hence, the promotion of these technologies needs to take a holistic approach combining technology demonstration and awareness creation with investment support, technical training and backstopping during implementation. Private technology providers play an important role in hands-on training and technical support to users and need to be involved in technology rollout. With the gradual scale-up of technologies, support for public-private partnerships to build skills and expertise of service providers is critical. Likewise, close on the ground monitoring and assessment of results is needed to enhance trust and create robust evidence. Project investments complement ongoing efforts by the government, through MoAF/TAGEM and other agencies to support digital technology acceleration and entrepreneurship (through matching grants and incentive schemes) and through support for the establishment of platforms for data and experience sharing and overall contributing to strengthening the digital ecosystem for the agriculture sector in Turkey.
  - ***The suitability, benefits and profitability of individual smart and precision technologies is often site-specific depending on a host of factors, including agro-ecologic and soil conditions, farm size structure amongst others.*** Overall, the conditions determining technical suitability and profitability of smart and precision agriculture technologies are not sufficiently understood. There is a need to accompany technologies roll out in different geographic locations with a combination of peer-to-peer learning and knowledge exchange, data sharing platforms and robust analysis of their benefits/impacts.
- **Stakeholder participation, stepwise approaches and adaptive management are critical to support innovations and technological adoption.** The roll-out of the subcomponents linked to technological adoption has incorporated piloting approaches, strong stakeholder engagement and systematization of learnings, as key previous steps to scaling-up efforts.
- **The public sector plays a key role in generating and disseminating data that encourages innovation and competition and at the same time reduces opportunities for market capture**. Global and country experiences

[69] Including a survey undertaken by TAGEM to inform the e-agriculture strategy and the ongoing study on the use on smart agriculture technologies in the agricultural sector by FAO and EBRD.

of open data access to relevant soil and land information have demonstrated the power of investing in narrowing information gaps to promote innovation and competitiveness. Examples of this are LANDSAT data leading to wider applicability, and the efforts of the government of Uruguay to provide free access to soil information leading to more competitive land markets. The format on which the soil and land information is disseminated and accessible to different users is critical to influence its impacts.

- **Well-defined institutional arrangements, clearly designated responsibilities supported by capacity building activities and an umbrella project coordinating body to manage and coordinate overall project implementation are crucial for successful implementation**. Lessons from both the Eastern Anatolia and Anatolia Watershed Rehabilitation Projects (P009023; P070950) showed that clarity over each institution's responsibilities is an important factor for successful and effective interagency collaboration. The interface among various agencies at the central as well as local levels needs to be carefully defined, managed, and budgeted. The Agriculture Reform Implementation Project (ARIP, P070286) demonstrated the importance of a coordinating implementing agency as a neutral body when there are multiple agencies involved. The institutional arrangements for the project reflect these lessons.
- **Piloting approaches provide a good foundation for further scaling-up innovations, and success at scale is largely linked to the institutionalization of the innovations.** The ARIP project (P070286) experience of implementing innovative / new approaches (such as sustainable land use, village based participatory investments), showed that in designing radically new programs, it is always best to pilot new approaches (or their obvious alternatives) before scaling up. The project will apply a similar approach while introducing new technologies or business models. Furthermore, one reason for the relatively high degree of success of the diverse investment program under ARIP was that the new/innovative subcomponents were implemented by regular line agencies rather than stand-alone project management units, thus building ownership and expertise ready and able to carry on, after project closing. The project implementation arrangements also reflect this lesson.
- **The project will benefit from a set of lessons from project experiences as it moves to implementation.** This includes emerging lessons from ongoing studies (e.g. ongoing study on geothermal applications in Turkey), and the wide Bank's experience around approaches for manure management (e.g. Romania Integrated Nutrient Pollution Control Project (P155594); Anatolia Watershed Rehabilitation Project (P070950) in Turkey, Guangdong Agricultural Pollution Control Project (P127775) in China), which have demonstrated that reduction in nitrate discharges into water bodies can be achieved through improving manure management; with effective awareness campaigns and knowledge dissemination as critical to influence farmers behavior.

III. IMPLEMENTATION ARRANGEMENTS

A. Institutional and Implementation Arrangements

61. **Responsibility for overall project implementation, including management and coordination will lie with the MoAF, through the Project Implementing Units (PIUs).** The PIUs will be established at the leading General Directorates (GD) responsible for specific subcomponents and will be responsible for overseeing project activities under their respective subcomponents and ensuring effective engagement with MoAF's units and relevant stakeholders at the provincial level. PIUs include the General Directorate of Agricultural Reform (TRGM) (Subcomponents 1.1., 3.1, 3.2, and 3.3), the General Directorate of Food and Control (GKGM) (Component 2), the General Directorate of Information Technologies (BTGM) (Subcomponent 1.2), the General Directorate of Agricultural Research and Policies (TAGEM) (Subcomponent 3.4), and the General Directorate of EU and Foreign Relations (ABDGM) (Component 4).

62. **A Project Coordinating Unit (PCU) responsible for overall project coordination will be established.** The PCU will

be responsible for overseeing overall implementation and management of the project, ensuring proper application of all project-related requirements, and preparing all project documents to be submitted to the Bank. The PCU will be located at the ABDGM. The PCU will host a dedicated multidisciplinary team of project management, technical, financial management, procurement, environmental, and social specialists with qualifications satisfactory to the WB. The PCU's functions will be overseen by the leading Vice-Minister.

63. **A Project Steering Committee (PSC) will be established to ensure effective coordination at a higher level and provide strategic advice.** The PSC will have participation of senior leadership of the General Directorate (GD) leading implementation of the subcomponents, including Deputy General Directors from the relevant GDs (TRGM, GKGM, TAGEM, BTGM and ABDGM), as well as representatives of other related institutions. The PSC will be chaired by the Vice Minister of the MoAF (to whom TRGM, and GKGM report), with the PCU acting as the Secretariat. The key functions of the PSC will be to review the annual workplans and budgets (AWPB), monitor implementation progress, ensure effective institutional coordination, and provide guidance as needed for ensuring the delivery of project outputs and achievement of project outcomes. A Technical Coordinating Committee (TCM) will also be established to ensure close project coordination on a regular basis (for details see Annex 1).

B. Results Monitoring and Evaluation Arrangements

64. **The overall project M&E will be under the responsibility of the PCU, which will be supported in this task by dedicated staff.** The PCU will coordinate with the PIUs of respective GDs at the central level on M&E activities, including for collecting data on their respective activities and results indicators per the project's results framework. The PIUs will provide periodic reports to the PCU in agreed formats specified in the POM. Semi-annual Progress Reports for monitoring implementation progress and results will be prepared by the PCU and submitted to the PSC and the WB for information and decision-making on corrective measures and annual work plans and budgets. Semi-annual joint implementation support missions with representatives from the WB and GoT will ensure compliance with legal covenants and implementation progress.

65. **Given the pilot nature of some of the activities, the M&E system of the project will comprise both performance and impact monitoring.** The project's approach to M&E comprises three main pillars: (i) monitoring project outcomes (PDO results and intermediate indicators); (ii) stakeholder-based monitoring approaches to understand adoption of technologies and perceptions of the benefits and tradeoffs of such technologies and associated service provision; and (iii) impact-based assessment approaches to understand the benefits of the technologies promoted by the project, particularly the most novel ones.

66. **The project will establish an integrated Monitoring Information System (MIS), which will consolidate information needed for the assessment of implementation performance, but also to monitor achievement of indicator targets.** For the activities under Component 4, under each subcomponent, the project will establish baselines. Activities under the subcomponents will be used to monitor perceptions on the technologies and associated service provision dimensions, complemented with farm-based tools such as surveys and/or self-assessment tools, online platforms and farm fora. This stakeholder-based participatory nature of the monitoring activities will be complemented with more structured evaluations (using semi-experimental approaches, if possible) to assess the effectiveness, results and impact of the various technologies at field/farm level for different types of producers, crops and regional conditions. These evaluations will generate more robust evidence about the enabling conditions for successful use of the different technologies, the type and magnitude of benefits generated (economic, environmental), under which conditions technologies are profitable, and which type of support - technical and financial - is required. Together with user

testimonies, the results of the evaluations will support the broader uptake of smart technologies by enhancing farmers' interest and willingness to invest, and financial institutions' willingness to finance them.

67. **The PCU will be responsible for overall M&E of project outputs and results, working closely with PIUs at each directorate leading subcomponent activities, as well as the development and monitoring of annual work plans.** A full-time M&E specialist will be appointed for leading the results measurement, with guidance from the WB, and for compiling M&E data for consolidation into project progress reports. To ensure coherence and alignment, an M&E technical working group will be established to further refine the overall M&E strategy for the project including alignment of measurement approaches and strategies for data capture, reporting and evaluation. The M&E working group will be coordinated by the PCU specialist on M&E. TAGEM will play a key role providing technical support and guidance to TRGM on the approaches to assess technology impacts. For the activities under Subcomponent 1.1., the project will establish a "Soil Monitoring System" to understand the impacts of the information generated under this subcomponent, guiding policy decisions at the provincial level (through the Soil Protection Board). In addition, M&E capacity building under Component 4 will facilitate understanding of gender dimensions and inequalities in the sector. The project will provide technical assistance to encourage MoAF to introduce the measurement of gender indicators in their M&E system. These could include, for example, the development of specific mixed-methods to track gender (surveys, focus groups, specific evaluations), gender-specific evaluations, and use of diagnostics to recognize gender-specific constraints or opportunities and design policy interventions which could address these problems.

68. **The project mid-term review (MTR) will assess overall implementation progress and identify and resolve any key issues affecting implementation and, if necessary, adjust project design; a final assessment at project closing will also be undertaken**. The preparation of assessments/studies to inform the MTR, which is to be undertaken three years after project effectiveness, will focus on evaluating the achievement of project outcomes and impacts. In relation to project impacts, the focus will be particularly on the extent to which the project is creating conditions for a further scaling-up of technologies and approaches promoted by the project and ensure inclusion (small scale farmers, women, youth). The final assessment to be carried out at the end of the project will provide inputs for the Implementation Completion and Results report (ICR) – to be prepared within six months after the project closes—to evaluate the final results, assess overall performance, and capture key lessons. Specific M&E activities will be incorporated into the budget of each subcomponent, while the most transversal assessments (i.e. mid-term evaluation/studies and final assessments— to be carried out by independent specialists that will be recruited under the project) will be covered under Component 4 budget.

C. Sustainability

69. **The project's sustainability is reinforced by GoT's strong ownership of the overall project concept and design elements laying the foundations for a more sustainable, resilient, and competitive agricultural sector.** The project supports activities that were thoroughly identified and selected during consultations with many stakeholders involved in project preparation and appraisal. The project follows an integrated approach of including a mix of investments in agricultural services, enhanced information systems in land-use planning and policy decisions, and the promotion of CSA technologies (including digital) that are reflected in key national Plans and Programs.

70. **The project's sustainability is also reinforced by GoT's commitment to keep investing in a sustainable and greener sector**. Regulatory developments in key export markets such as the EU (e.g., Green Deal), as well as globally, will continue to be a strong driver of developments in this area in Turkey, ensuring mid/long government commitments to this agenda**.** Turkey is also committed to investing in institutional capacity strengthening, which further ensure

sustainability. The project follows a holistic and systematic capacity building approach by strengthening public institutions for better service delivery and building the capability (enhancing knowledge and skill) of personnel in various public and private institutions for better and improved leadership, organizational, managerial, financial, and technical capabilities. These will contribute to increased and enhanced capacity of public institutions and personnel, which will in turn improve resilience and ensure sustainability. Technical sustainability will be ensured through a variety of ways, as follows.

71. **The project has incorporated mechanisms to ensure that project investments around narrowing soil/land information gaps are sustained over time**. The project will support the establishment of a Data Science Unit within TRGM/MoAF, which will remain operational after project closing, with staff trained to perform tasks required for operating and maintaining the dynamic mapping and modeling and the national soil monitoring system. The project will also support the establishment of a dynamic modelling system to monitor soil information, specifically around soil threats, ensuring that the information generated by the project is not static and will be continually updated and that capacity is in place to follow-up. Furthermore, information by users will be used to determine priorities and contribute to sustainability. The project will focus on establishing friendly data systems/platforms and package the information in a way that facilitates usability by a wide range of stakeholders based on valuable experiences worldwide (e.g. soil index in Uruguay).

72. **The sustainability and scalability of the technologies promoted by the project will rely on the broad understanding of benefits/tradeoffs, as well as of the effectiveness of associated services supporting adoption**. The project has been designed to work closely with the private sector, academia and other actors to build knowledge and capacity to scale-up technologies and enhance quality of service provision; furthermore, knowledge platforms and exchange among farmers as well as more systematic mechanisms to assess benefits and tradeoffs will be critical to ensure long-term sustainability and inform supportive policies. Although only a sub-set of farmers will benefit directly from co-shared investments and training, the project is to play a demonstration effect and will create broad capacity for service provision and stronger collaboration across the sector, as well as inform support policies, setting a solid ground for further scaling-up of CSA technologies.

73. **Capacity around laboratory infrastructure will incorporate good practices to ensure sustainability**. Those good practices include following a market-driven approach to the supply of laboratory services, complemented with approaches to ensure long-term government commitments to funding for the types of services where external demand is low, and the benefits are more associated to public goods (e.g. R&D efforts). The assessments of the feasibility of the investments will include assessment of demand, operational costs and public funding needs, considering valuable relevant regional and global experiences.

IV. PROJECT APPRAISAL SUMMARY

A. Technical, Economic and Financial Analysis (if applicable)

74. **Technical design.** The project technical design builds on opportunities to: (i) add value and scale up MoAF's efforts on areas where the institution has already developed important experience and capacity; and (ii) to complement ongoing efforts, through innovations and piloting approaches, around building a greener, more resilient, and competitive agriculture sector. MoAF's recent experience in the mapping of Turkey's land and soil resources is to be strengthened through incorporating global knowledge on approaches to soil surveys and the establishment of dynamic models for monitoring soil threats making use of digital technologies. The project design supports a strong innovation and research agenda, with a focus on CSA technologies (digital technologies) and anchored on a strong private sector and stakeholder

participation, thus, complementing and enhancing ongoing efforts by MoAF on promoting traditional CSA approaches such as organic agriculture. The project design has been informed by surveys carried out by MoAF on the uptake of digital technologies in Turkey;[70] assessments of the sector such as the Digital Agriculture Profile (DAP) prepared by the WB, CIAT and FAO; a study on the use on smart agriculture technologies in the agricultural sector by FAO and EBRD (ongoing); OIE's 2017 Performance of Veterinary Services (PVS) Pathway, studies and strategies prepared in participation with multiple stakeholders, such as the National Action Plan for Sustainable Soil Management in Turkey prepared with support of FAO; as well as surveys and experiences of other countries in the application of precision agriculture technologies (largely the EU and USA); and relevant knowledge documents and project investments by the WB reflecting emerging global knowledge.

75. The project has been designed to ensure complementarity between investments, both at the enabling environment and supply-chain levels. For example, in the livestock sector, enhancing capacities for disease surveillance and control are complemented with a strong knowledge agenda on effective manure management approaches. Project preparation has been carried out in close technical collaboration within MoAF's Departments/GDs, to ensure appropriate design and inclusiveness across all the relevant subcomponents for strong ownership. The institutional arrangements include mechanisms to ensure efficient and effective coordination among GDs responsible for project implementation. During project implementation, detailed feasibility assessments and baseline assessments will be carried out to further inform technology selection, the scope of pilot investments and monitoring and evaluation approaches. Surveys and stakeholder-based platforms will be key tools to understand perceptions, get feedback and adjust during implementation as needed. The project adopts a flexible and adaptable approach to incorporate emerging learning and feedback from stakeholders.

Economic and financial analysis

76. Ex ante economic and financial analysis was carried out to evaluate the project feasibility considering the following expected benefits: Component 1: (i) reduction of losses of agricultural land, and (ii) reduction of information access costs for the decision-making process; Component 2: (i) reduction in animal mortality, and (ii) increase in exports of animal products; Component 3: (i) increase in crop yields and animal production, (ii) reduction in agricultural inputs use such as water, energy, pesticides, fertilizers and fuels, and (iii) increase in revenue as a result of product differentiation.

77. The analysis was designed to estimate standard measures of project expected returns including Incremental Net Present Value (NPV), Internal Rates of Return (IRR), Benefit/Cost ratio (B/C) and payback period. These indicators were estimated: (i) for the overall project; (ii) by project components; (iii) by subcomponent type; and (iv) by technology package. Scenario analysis and sensitivity analysis was carried out to explore the likely impacts of possible changes in key variables such as benefits, costs, and interest rates. All cash flows were estimated using nominal prices. The estimates were performed for a 20-evaluation period and 6% of social discount rate and 6% of cost of capital. Additionally, several specific assumptions and parameters were used to estimate the aforementioned indicators according to the characteristics of the activities implemented by the project (See Annex 3).

78. The results of the economic analysis (including carbon benefits) show a positive economic return on investment. The NPV, IRR, B/C and payback period were estimated at US$311.6 million, 7.23%, 1.28 and 12.38 years, respectively. In disaggregated terms, Components 1, 2 and 3 result in positive returns on investment with estimated NPV of US$142.6, US$41.7 and US$127.2 million; IRR of 9.34 % and 9.25 % and 6.65%; B/C of 1.31, 1.54 and 1.22, and payback period of

[70] The survey was developed by TAGEM in 2019-20, and final results are yet to be finalized and published. The emerging results of the survey are informing the preparation of the e-Agriculture Strategy (ongoing).

11.37, 12.50 and 12.65 years, respectively. In addition, the estimated financial indicators show mixed results depending on the value of the cost of capital for the agricultural sector in Turkey. Considering a cost of capital of 6%, the NPV, IRR, B/C and payback period were estimated at US$121.1 million, 6.43%, 1.14 and 12.95 years, respectively.

79. Without accounting for the project's GHG reduction benefits, the overall project is still profitable in economic terms with a NPV, IRR, B/C and payback period of US$166.4 million, 6.7%, 1.15 and 12.80 years respectively. Likewise, the IRR increases significantly until 7.80% in a scenario of high carbon prices. In addition, 10% of decreasing in incremental income value reduces the IRR of the overall project to 6.80%. The overall project's IRR increases to 7.89% in a 20% cost reduction scenario. The project results in positive returns on investment in economic terms despite a moderately pessimistic scenario of interest rate increases and devaluation of the local currency in relation to the dollar.

B. Fiduciary

(i) Financial Management

80. Most of MoAF's GDs involved in project implementation have no experience in implementing WB financed operations. Furthermore, given the complexity of the project with multiple GDs as implementation units and envisaged grant mechanisms, the financial management risk is assessed as **Substantial**. An initial action plan has been prepared to strengthen fiduciary capacity. The action plan is presented in Annex 1. Table 1 briefly summarizes the assessment with respect to various elements of the country system which would be used for FM:

Table 1: Country System Financial Management Elements and Use Within the Project

Element of country system	Extent used for this project
Budgeting	The national budgeting procedures will be used. The spending GDs will need to have sufficient budgetary allocation in the Budget Law for project expenditures. The project's planning will be coordinated by ABDGM.
Internal Controls	MoAF's existing controls, which were established in line with the Public Financial Management and Control Law, will be used. Additional control points specific to the project transactions will be added where necessary. These procedures will be described in the Financial Management Manual. In addition, MoAF will be expected to determine and document the details of the internal control framework, workflows, document and fund flows mechanisms for the grant schemes.
Staffing	MoAF will appoint FM staff with adequate qualifications to the PCU and PIUs in the GDs. Given additional workload caused by the project, MoAF's PCU will strengthen the FM function with additional staff or consultants as necessary. Currently the project envisages recruiting two FM consultants for that purpose.
Accounting & Reporting	The accountant of the Ministry of Treasury and Finance maintains the accounts of MoAF in Turkish lira using their Integrated Financial Management System. MoAF's PCU will establish a parallel system for accounting and reporting for the project in foreign currency and to address the project's special reporting needs.
Flow of funds	A Designated Account (DA) will be opened at the Central Bank of Turkey for transfers to and from the loan account. The DA will be managed by the PCU in ABDGM.
Auditing	The Treasury Controllers will be the auditors of the project as the external auditors for Bank-financed projects implemented by line agencies.

81. The general requirements for MoAF throughout implementation will be to:
- Maintain an adequate project financial management system;

- Maintain at least one dedicated financial management staff and one financial management consultant throughout the project implementation period;
- Prepare interim unaudited financial reports for the project on a quarterly basis and submit these to the WB no later than 45 days after the end of each quarter;
- Have the project financial statements audited by the Treasury Controllers on terms of reference acceptable to the WB. The format of the financial statements are attached to the Minutes of Negotiations;
- Submit the annual audited statements of the project to the WB within six months of the end of each fiscal year; and
- Make the project audit reports publicly available.

(ii) Procurement

82. The WB Procurement Regulations for IPF Borrowers – November 2020 ("Procurement Regulations") will apply to the project. The WB's "Guidelines on Preventing and Combating Fraud and Corruption in Projects Financed by IBRD Loans and IDA Credits and Grants", dated October 15, 2006 and revised in January 2011 and as of July 1, 2016 (Anti-Corruption Guidelines)" will also apply to the project. The Borrower, through MoAF, has developed a Project Procurement Strategy for Development (PPSD) pursuant to paragraphs 4.1 and 4.2 of the Procurement Regulations. The PPSD discusses the Borrower's procurement implementation arrangements, and an initial Procurement Plan for the first 18 months of the project. The initial Procurement Plan includes the cost estimates, selection methods, review procedures, and envisaged time frame of the activities/contracts according to paragraph 4.4 of the Procurement Regulations.

87. The Borrower, through MoAF, will use the WB's Systematic Tracking of Exchanges in Procurement (STEP), an online procurement tracking tool to prepare, clear, and update its Procurement Plans and conduct all procurement transactions. The PCU under the ABDGM will coordinate and manage the project procurement activities. The PIU of each participating GD will conduct procurement with the support of respective technical departments. The procurements under the small matching grants scheme that will be implemented by TRGM under Subcomponent 3.2 of the project will be carried out by the eligible project beneficiaries through their established procurement arrangements. The overall procurement risk is assessed as **Substantial**. More details on the procurement assessment findings, risks relevant mitigation measures, and proposed procurement supervision arrangements are provided in Annex 1.

C. Legal Operational Policies

	Triggered?
Projects on International Waterways OP 7.50	No
Projects in Disputed Areas OP 7.60	No

D. Environmental and Social

88. **Environmental risks and impacts.** Overall, the project environmental risk is rated as **Substantial.** The project will generate multiple positive environmental outcomes and impacts by reducing vulnerability to climate shocks, increasing climate resilience, and reducing GHG emissions and pollution due to more effective agricultural input use. Furthermore, the piloting model for clustering greenhouse production around an efficient energy source is expected to have positive

environmental impacts in terms of more efficient resource use and reduced pollution, among other benefits. However, the project activities associated with civil works might generate a series of adverse risks and impacts, specifically: emissions of dust and vehicle exhausts impacting air quality; noise and vibration; generation of hazardous and non-hazardous waste and soil pollution; occupational health and safety (OHS)-related risks; road-related risks from increased traffic volume and movement of heavy-duty vehicles; associated community health and safety (CHS); health risks associated with pest management activities in greenhouses; and risks of spreading COVID-19. Under Subcomponent 3.3 (supporting manure management activities and potentially constructing a biogas and organic fertilizer production facility), the project may generate exposure to pathogens and vectors and raise technical safety issues (at this stage, no details or feasibility studies on proposed activities are available).

89. Activities under Component 2 targeted at "Enhancing animal health capacity for effective disease surveillance and control" will support upgrades to the VCI's infrastructure to increase laboratory biosafety levels up to BSL2 and BSL3, by investing in critical construction work and equipment needs, biosafety equipment, and biosecurity trainings. It will also support the establishment of a centralized Veterinary Medicinal Control Center, which will also potentially generate a series of biosafety risks during the operation phase. Construction related to accessing geothermal energy (e.g. drilling, power production, energy transmission line, electrical substation, water reservoirs and pumping stations), building greenhouses and fruit processing facilities, and the TDİOSB infrastructure (e.g. wastewater treatment plant, facility for harvesting rainwater, biogas production plant, organic fertilizer production facility) could have negative impacts on natural habitats and flora and fauna resources. The Substantial risk rating is also due to the limited experience of the client with Bank-financed projects, the Environmental and Social Framework (ESF) and its environmental and social standards (ESSs) requirements. Nevertheless, while the PCU will be new, the PIUs have experience in the implementation of sizable grant programs (e.g. grant programs funded by the EU such as the Instrument for Pre-Accession Assistance Rural Development (IPARD), already in its third cycle, soil surveys and other activities proposed by the project). Furthermore, the laboratories to be upgraded are already accredited (ISO 17025), which means that the GKGM is experienced in accreditation processes. The E&S staff is to be hired, which means that capacity building will be necessary to manage the potential environmental and social risks and impacts. Specific measures in this regard for the PCU, PIUs and other involved parties are specified in the Environmental and Social Management Framework (ESMF).

90. The social risk assessed as **Substantial**. Although the majority of the activities to be financed are composed of Technical Assistance (TA), capacity building and information dissemination activities, and provision of contemporary IT equipment, the project will also finance a range of activities and small-to-large scale investments in many provinces of Turkey located in different geographical regions.

91. The activities of Subcomponent 1.1 will support the execution of soil survey studies. MoAF already carries out soil surveys with an approach to minimize E&S impacts and risks: the studies cannot commence without the consent of the landowner and priority is given to carrying out the studies when the lands are not cultivated, etc. Therefore, land acquisition and land use restrictions are not expected due to activities under Subcomponent 1.1. If any damage occurs on the lands subject to soil survey or on the adjacent lands, these will be compensated in accordance with the entitlements defined in project's Resettlement Framework (RF). For the soil surveys that will be financed under the project, stakeholder consultation meetings will be carried out to inform the landowners and relevant public authorities at provincial/district/village level. During these consultation meetings, project's Grievance Mechanism (GM) will also be introduced to the participants to inform them that they have the right to raise any concerns, grievances, suggestions, etc. to the project management through this GM. The provisions related to stakeholder consultations and implementation of the soil surveys will be included in the TORs and the contracts of the Contractors that will carry out the soil survey. The activities under Subcomponents 2.1, 2.2, and 3.1 will not require land acquisition since existing

public lands will be utilized for the project. However, there may be informal land use risks on selected public lands which will be managed as defined in RF. Once details of the subprojects are identified, potential risk and impact assessment and relevant mitigation measures will be included the project's E&S instruments. The construction activities may require land acquisition and bring along temporary/permanent land use restrictions, rights of easement, impacts on livelihoods/removal of assets and structures from the land for Subcomponent 3.3. Physical displacement of people is not expected. Apart from the potential land acquisition needs, the civil works will have standard, temporary and site-specific construction impacts.

92. The majority of the activities under Subcomponents 1.2, 3.2, and 3.4 will focus on provision of TA for a wide range of stakeholders to build their capacity, execution of stakeholder consultations/awareness campaigns, dissemination/analysis of data collection and acquisition of software/hardware/equipment, technical expertise and field validation of digital solutions. However, Subcomponent 3.4. will also include purchasing and installing new equipment for the existing research institutes and small-scale civil works for refurbishing of their existing facilities, hence no land acquisition is required.

93. Social risks and impacts are largely associated with labor and working conditions, OHS, land acquisition and resettlement, CHS (including COVID-19). Turkey has a good OHS legal framework, but enforcement is weak and there is a risk that potential issues may arise during project implementation. The project is not expected to have adverse impacts on vulnerable groups (farmers, women, poorer or young/elder farmers, etc.) and will engage them actively in project implementation in line with the Stakeholder Engagement Plan (SEP). MoAF has limited experience with the ESF, including preparing and implementing SEP, RF and Labor Management Procedures (LMP). The PIU will be provided with training and support during preparation including TORs for the development of E&S instruments and hiring of experts. The E&S project specialists, with the support of consultants, will be responsible for continuous monitoring of construction works to assure compliance with the ESMF, RF and the LMP, as well as to oversee the implementation of the SEP. The vulnerable individuals/groups identified are woman farmers, elderly farmers, illiterate farmers, tenant farmers, illiterate workers, seasonal agricultural workers including migrants, persons with disabilities. Special attention will be given to incorporate the views of disadvantaged/vulnerable groups/individuals and make them to fully benefit from the opportunities of the subprojects. The Sexual Exploitation and Abuse/Sexual Harassment (SEA/SH) risks associated with civil works are assessed as low. The national law and legislation on SEA/SH is in place and it includes robust measures for addressing SEA/SH risks, including Codes of Conduct for employees and contractors.

94. **Environmental and social standards relevant to the project.** All ESSs (including: ESS1 Assessment and Management of Environmental and Social Risks and Impacts; ESS2 Labor and Working Conditions; ESS3 Resource Efficiency and Pollution Prevention and Management; ESS4 Community Health and Safety; ESS5 Land Acquisition, Restrictions on Land Use and Involuntary Resettlement; ESS6 Biodiversity Conservation and Sustainable Management of Living Natural Resources; ESS8 Cultural Heritage; and ESS10 Stakeholder Engagement and Information Disclosure), except for ESS7 and ESS9 are relevant to the project. The country does not have any recognized indigenous or traditional underserved local communities, and the project is not going to apply financial intermediary bodies. Furthermore, the proposed project does not trigger (i) the WB Operational Policy 7.60 on Disputed Territories as it will be not implemented in such areas; or (ii) OP 7.50 on International Waterways as the proposed activities will not generate any impacts on such waterways.

95. **Scope of the ESMF**. To address identified risks and impacts of the project, the MoAF prepared an ESMF based on national laws and regulations, the WB's ESSs, WBG's Environmental Health and Safety (EHS) General and sector-specific (if applicable) Guidelines, and Good International Industry Practices (GIIP). The ESMF includes: (i) baseline analysis of

the country and of the regions where most of proposed activities will be implemented; (ii) regulatory framework for Environmental and Social Assessment (ESA), including provisions of the national laws and regulations as well as main requirements of the WB ESA guiding documents and ESSs; (iii) proposed project activities and investments, including associated facilities under Component 3.1; (iv) eligibility and screening criteria (along with distinct exclusion criteria), for proposed activities; (v) assessments of the potential E&S risks and impacts and generic mitigation measures, including mitigation and management procedures; (vi) guidelines and procedures for conducting Environmental and Social Impact Assessment (ESIA); (vii) requirements for preparing water balance, as construction of new greenhouse subprojects that are associated facilities might significant consumers of water, providing clear criteria for when this would be required; (viii) outlines site-specific ESIA, ESMP and ESMP Checklists (for activities related to small scale construction and rehabilitation activities); (ix) requirements on pesticides and fertilizers purchase, transportation, storage, use, handling and disposal during greenhouses' operation, (x) requirements in terms of pest management and a template for an IPM Plan; (xi) requirements for subproject monitoring plans; (xii) responsibilities for implementing site-specific ESMPs and ESMP Checklists; (xiii) outline of a specialized program for information dissemination and capacity building activities on several key issues (water and energy efficiency in greenhouse operations, pest control and safety; OHS issues; manure management; etc.); and (xiv) ESMF implementation arrangements, and capacity building activities for the PCU, PIUs and other involved parties. Moreover, the ESMF includes necessary actions to address COVID-19 risks, in line with the national guidelines and WB Note on "COVID-19 considerations in construction/civil works projects." The site-specific E&S instruments (ESIA; ESMPs; RPs) will be prepared based on the initial E&S assessments once the investments and their location details are finalized, completed, and disclosed before the completion of bidding document packages.

96. The ESMF specifies that subproject specific ESF instruments (ESMP, ESMP Checklist, LMP, RP, SEP, etc.) will be part of the bidding documents, contracts, and grant documents, as deemed necessary. The contractors and the grant beneficiaries will be responsible for the implementation of the ESIA reports and ESMPs, and MoAF (through the PCU and PIUs) will be responsible for the review and approval of all documents and the quality of each ESIA/ESMP. MoAF will also be responsible for monitoring the implementation of the E&S documents and report the status of implementation to the Bank. The ESMF also specifies that upgraded and constructed BSL 2 and 3 veterinary laboratories prior to carrying out any operations are certified by an external third party, satisfactory to the WB and are subject to regular monitoring. The document also includes procedure for ESA of associated facilities under Subcomponent 3.1, specifying that the Borrower (through MoAF) will ensure this will be done in accordance with the rules specified in the document and in compliance with the national and WB ESSs requirements.

97. The ESMF also identifies relevant social risks, the legal and institutional background in key social areas relevant to the project with a focus on gaps between national law and the ESF, and outlines mitigation measures, roles and responsibilities for their implementation proportionate to the level of risk. In this regard, the ESMF provides an overview of risks, legislation and practices relevant to: labor rights and safety (consistent with ESS2), land acquisition, restrictions on land use and involuntary resettlement (consistent with ESS5), community health and safety (consistent with ESS4), and stakeholder engagement (consistent with ESS10). The ESMF also identifies disadvantaged and vulnerable groups as relevant to this project and outlines differentiated measures that will be undertaken by the project to ensure no disproportionate harm, and their equal access to project benefits.

98. **Resettlement Framework (RF)** has been prepared to outline procedures for land acquisition, land use restriction, involuntary resettlement, compensation, and livelihood restoration in line with ESS5. While major land acquisition or physical resettlement is not anticipated, construction investments to be financed within the scope of the project may lead to small-scale land acquisition and resettlement. The exact scale and scope of land acquisition are not known at

this time since the exact locations of project activities are not finalized.

99. **The Stakeholder Engagement Plan (SEP)** prepared, outlines the general principles and strategy to identify key stakeholders and plans for an engagement process per ESS10. Each PIU through the support of the PCU will prepare SEPs for the sub-project activities under their implementation in line with the SEP before civil works begin. The SEP mapped out direct, indirect and interested stakeholders for the project, as well as vulnerable and disadvantaged stakeholders. The SEP then outlines different engagement modalities tailored to the needs and characteristics of each stakeholder group, and factors in COVID-19 sensitive measures. The SEP commits to inclusive and accessible consultations and project GM.

100. **MoAF's Environmental and Social Commitment Plan (ESCP)** specifies the main responsibilities and actions to be undertaken by the MoAF through its PCU and PIUs to ensure project compliance with the WB ESSs and in particular: (i) conducting environmental and social screening for all project activities via ESMP/ESMP Checklist covering the above aspects; (ii) application of the ESMF and RF to all project activities, including for associated facilities under Subcomponent 3.1 and the need to prepare site specific ESMPs and Resettlement Plans and sub-project specific SEPs; (iii) reporting on environmental and social performance of all activities on a biannual reports; (iv) ensuring transparency in providing project environmental safeguards and ensuring all ESIA and/or ESMPs are disclosed and publicly consulted with all interested parties; (v) maintaining through the whole period of project implementation human capacity in the PCU and PIUs to ensure project activities ESIA and ESMP supervision and monitoring and providing adequate reporting to the implementing agency and to the WB. When needed, there will be hired on temporary basis external consultants with specific expertise in biosafety of veterinary laboratories (including biosafety certification); (vi) preparation and adherence to the Environment, Social, Health and Safety Code of Conduct by works contractors; and (vii) implementing and reporting on SEP, LMP, and GM; and (viii) requirements for upgrading and constructed BSL 2 and 3 veterinary laboratories and ensuring they are certified by an external third party, satisfactory to the Bank, and being subject to regular annual monitoring also carried out by an external third party, until the country has adopted national regulations for such monitoring.

101. The ESMF, LMP, RF, SEP and ESCP documents were disclosed on November 29, 2021, on the project's webpage (https://www.tarimorman.gov.tr/ABDGM/Menu/160/Tucsap-Proje-Sayfasi) and the public consultation was done on December 13, 2021. During the consultations no critical comment or feedback was received. The documents have been revised accordingly to reflect all issues raised during the consultations as well as recommendations from the stakeholders that participated in the consultation meeting. The documents were redisclosed on January 27, 2022 on the project's webpage.

V. GRIEVANCE REDRESS SERVICES

102. Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project may submit complaints to existing project-level grievance redress mechanisms or the WB's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the WB's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's corporate Grievance Redress Service (GRS), please visit

http://www.worldbank.org/en/projects-operations/products-and-services/grievance-redress-service.
103. For information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org.

VI. KEY RISKS

104. The overall risk of the proposed project is rated **Moderate**. The following paragraphs review the considerations that led to such rating.

Table 2: Project risk categories and ratings

Risk category	Rating (H, S, M, or L)
1. Political and governance	L
2. Macroeconomic	M
3. Sector strategies and policies	L
4. Technical design of project or program	M
5. Institutional capacity for implementation and sustainability	S
6. Fiduciary	S
7. Environment and social	S
8. Stakeholders	M
9. Other	M
10. Overall	**M**

105. **Political and Governance risks is Low.** Although vulnerabilities in Turkey have increased as a result of pre-existing economic challenges, aggravated by COVID-19 pandemic, Turkey's challenges are not insurmountable and a more sustainable set of policies would help prospects for strong durable growth and for rebuilding buffers, which the government is trying to pursue. It is not expected that political or governance factors at a macro level, will have implications in the achievement of project development objectives.

106. **Macroeconomic risk is Moderate.** Fiscal challenges and inflationary pressures have increased during COVID-19 pandemic. Input cost increases (e.g. fertilizers and energy), due to inflation and global pressures, could affect importantly the profitability of the sector and willingness to invest translating into declining productivity. The Central Bank of Turkey has stated its commitment to price stability, to a flexible exchange rate, and to a fully-fledged inflation-targeting regime and overall to deliver a firm monetary policy stance; however, the global situation remains very fragile with potential impacts at the macro level, in the short and mid-term.

107. **The risk for sector strategies and policies is Low.** Turkey has made important progress on prioritizing agriculture climate action as part of the national climate change plans and strategies and on aligning national development plans and sectoral programs, around such climate change objectives. The country has recently ratified the Paris Agreement, which opens opportunities for deepening commitments around climate net emissions, including in the agriculture sector. Although support policies to agriculture are still highly focusing on price support and variable input subsidies, it is expected that public support aligned with more sustainable and climate resilient sector will gradually increase. Therefore, this risk is rated as Low.

108. **Technical design risk is Moderate.** Although CSA digital technologies are increasingly available in Turkey, their adoption remains limited and heavily skewed toward larger farmers. Main barriers preventing small and medium farmers from using digital technologies are low functional and digital literacy, limited awareness and knowledge of these options (including uncertainty about their usefulness, reliability, and profitability in practice), and a lack of funds to invest in them. Not all digital technologies marketed in Turkey have been sufficiently tested under local field conditions, especially considering the country's diverse agro-climates and soils. Some technologies generate data that must be interpreted and transformed into actionable advice, which requires service provision and information sharing arrangements to be in place. Smaller-scale farmers in particular may need the assistance of advisors to translate the information generated by digital tools into concrete, actionable recommendations, although some lower-cost technologies that can be used more easily by small and medium farmers are locally available.

109. The project will mitigate technical design risk by: (i) sharing the costs and risks of smart technologies with beneficiaries; (ii) providing training and capacity building for farmers, including digital literacy training, to equip them to use the technologies promoted through the project; (iii) selecting technologies based on a clear identification of the problems to be solved and on a demand-driven basis; (iv) strengthening the capacity of GDs in charge of implementing the related subcomponents and of the PCU by hiring additional expertise in smart technology; (v) enhancing the capacity of extension staff at MoAF at the central and provincial levels (and other local institutions) to advise farmers in identifying the most suitable technologies, and providing implementation support via training and capacity-building programs; (vi) developing platforms for farmers to exchange knowledge and experiences; and (vii) working in collaboration with farmer cooperatives and service/technology providers to monitor how technologies supported under the project are performing in the field. The project will also adopt a stepwise, incremental approach in deploying smart technology, starting with technologies that are already used successfully in various parts of the country by established commercial providers and moving gradually toward including a larger range of technologies. Training farmers in small groups before moving to training in larger groups will also help to mitigate technical risks. The project will also incorporate mechanisms to systematically gather information from beneficiaries and distill lessons from their experience to inform project implementation. Finally, the WB will provide technical support during implementation, bringing in specific expertise from Bank staff and other global expertise (e.g. FAO and experienced consultants). Conclusively, despite the innovate nature of CSA technologies (particularly digital) that the project will promote, the mitigation measures proposed are deemed satisfactory in reducing the identified risk, therefore, based on considerations of residual risk, the overall technical risk of the project is rated as Moderate.

110. **The risk related to institutional capacity for implementation and sustainability is Substantial.** TRGM will be responsible for implementing more than half of the project budget. For Subcomponent 1.1, TRGM has in place technical and procurement capacity to implement the proposed activities and has already undertaken large tender processes for similar activities. TRGM has significant experience implementing large grant-matching programs in close coordination with Provincial Directorates, it implements the EU funded IPARD program, with investments estimated at about US$600 million in the past few years. However, despite the solid experience implementing domestic and externally funded projects, the GDs with responsibilities in project implementation have limited recent experience with WB–financed projects, particularly regarding the Bank's fiduciary, environmental, and social policies. At the GDs responsible for activities under different project components and subcomponents, capacity improvements are needed to absorb the additional workload associated with project implementation and avoid hindering effective and efficient project management. In the short-term, major capacity risks lie with the PCU, as it will be established as a new unit, within ABDGM. The PCU will have a coordinating role, with the technical elements of the project implemented through the GDs. To mitigate institutional capacity risks, the PCU will be staffed with qualified staff (assigned by MoAF and/or hired externally). The Bank will provide hands-on support to the PCU and PIUs staff, in relation to Bank procurement rules and

E&S aspects. Furthermore, for the most innovative elements of the project, capacity will be strengthened by bringing in solid expertise (e.g. partnership with the Scientific and Technological Research Council of Turkey (TUBITAK) and hiring external qualified experts) and developing alliances with private service providers, universities, etc. To enhance coordination and collaboration, the project institutional arrangements include the establishment of a Project Technical Committee, as well as ad hoc technical committees for specific themes as needed. The residual risk of this risk category is Substantial, with opportunities to reduce it to Moderate during implementation.

111. **Fiduciary risk is Substantial**. The implementing agency (MoAF) has limited experience with WB financial management requirements and procurement procedures. Furthermore, the financial management arrangements are yet to be determined for grant schemes and the financial management coordination arrangements. TRGM has managed procurement involving large tenders to procure soil-related work, but not under Bank rules, therefore, its fiduciary capacity will require strengthening. Together with the limited knowledge and experience of MoAF in Bank-financed projects, the integrated fiduciary risk is assessed as Substantial at this stage. These risks will be mitigated by strengthening capacity at MoAF to navigate WB fiduciary systems and procedures, including the addition of specialized fiduciary capacity within the PCU. Detailed financial management and procurement assessments have been carried out during project preparation and detailed mitigation measures have been identified and agreed upon.

112. **Environmental and Social (E&S) risk is rated Substantial**. E&S risks are rated, individually, as Substantial, resulting in a combined Substantial rating. A detailed explanation of the assessment of these risks and assigned rating is presented in the Project Appraisal Summary section, paragraphs 88-93, while the range of WB standards that apply and mitigation measures are discussed in paragraphs 94-100 of the same section.

113. **Stakeholder risk is Moderate.** Issues related to data privacy could potentially deter farmers from participating in the project. To guarantee protection of personal and production data from each farm, the project proposes to adhere to the General Data Protection Rules used in EU projects. Aside from data privacy, key barriers to the adoption of climate-smart technologies (particularly precision farming) that have been identified in previous work include: (i) lack of familiarity with the technology; (ii) the technology generates a large amount of information, yet users do not always know what to do with it; and (iii) sometimes potential users are not convinced that the technology is in their economic and social interest. The risk that these technologies will attract little interest from farmers is acknowledged. The project plans to mitigate that risk by conducting strong dissemination campaigns when scaling up technologies, such as Open Days, when farmers share their experience with using these technologies. A project team will accompany farmers at different stages of technology adoption (installation, training, and support and farm monitoring during production cycles) to capture farmers' experiences, develop communication materials highlighting farmers' success stories and testimonials, and document the economic and social impacts of climate-smart digital technology. The project will also design a set of support tools such as a return-on-investment table, which enables farmers and agricultural services providers to monitor a range of variables, including cost impacts, to easily compare performance and financial results before and after the application of the technologies. The residual risk is rated as Moderate.

114. **Other risk—specifically, economic and logistical disruptions from COVID-19—is Moderate.** Project activities will start to be implemented in 2022. While the pandemic may still affect implementation and PCU/PIUs capacity at that stage, these effects are not expected at later stages. If travel restrictions and prolonged lockdowns occur over the long term, however, the project will consider the use of remote supervision tools, coupled with the deployment of field-based staff and consultants to allow basic monitoring and reporting to continue. These potential restrictions are also considered within the PPSD, to ensure that activities that are less affected by COVID-19 restrictions are facilitated and advanced.

VII. RESULTS FRAMEWORK AND MONITORING

Results Framework
COUNTRY: Turkey
Turkey Climate Smart and Competitive Agricultural Growth Project (TUCSAP)

Project Development Objectives(s)

Strengthen capacity for sustainable and competitive agricultural growth and promote the use of climate-smart agriculture in targeted regions in Turkey.

Project Development Objective Indicators

Indicator Name	PBC	Baseline	End Target
Enhanced capacity for sustainable and competitive growth in agriculture			
Land area with integral information to develop sustainable and competitive agricultural land planning/management (Hectare(Ha))		0.00	14,000,000.00
Increase in the analyses/tests for animal disease/zoonoses diagnostics processed in the upgraded/constructed laboratories (Percentage)		0.00	100.00
Increased use of climate smart technologies in the agriculture sector			
Farmers adopting Climate-Smart Agricultural (CSA) technologies (Number)		0.00	42,500.00
Farmers adopting CSA technology - Female (Number)		0.00	10,375.00
Farmers adopting improved agricultural technology (CRI, Number)		0.00	42,500.00
Farmers adopting improved agricultural technology - Female		0.00	10,375.00

Indicator Name	PBC	Baseline	End Target
(CRI, Number)			
Farmers adopting improved agricultural technology - male (CRI, Number)		0.00	32,125.00

Intermediate Results Indicators by Components

Indicator Name	PBC	Baseline	End Target
Component 1: Institutional Capacity Strengthening for CS Agri-food Policy, Planning and Investment			
Area with soil analysis and soil mapping performed (Hectare(Ha))		8,500,000.00	22,500,000.00
Information and decision support sub-systems to narrow soil and land information gaps and/or support soil/land monitoring (Number)		0.00	5.00
Area where land notes have been prepared under the project (Hectare(Ha))		0.00	78,300,000.00
Yield/production forecasting/warning models developed, piloted and under implementation (Number)		0.00	2.00
Users of the information supported by the project that apply it to support decision making (Percentage)		0.00	75.00
Component 2. Enhancing Animal Health Capacity for Effective Disease Surveillance/Diagnosis & Control			
Veterinary laboratory bio-safety level units (BSL 2) newly constructed or renovated and certified/approved to operate (Number)		0.00	12.00
Professionals from the network of animal health, veterinary institutes trained (including of the Veterinary Medicinal Control Center) (Number)		0.00	5,250.00

Indicator Name	PBC	Baseline	End Target
Control Center for Veterinary Medicinal Products (VETKOM) established and in operation (Percentage)		0.00	100.00
Veterinary laboratory bio-safety level (BSL 3) units newly constructed or renovated and certified/approved to operate (Number)		0.00	7.00
Component 3: Investments for Enhanced Productivity, Resource-Efficiency, and Climate Resilience			
Area prepared for climate-resilient greenhouse infrastructure (Hectare(Ha))		0.00	179.00
Infrastructure and service provision models piloted and lessons for scaling-up consolidated. (Number)		0.00	2.00
Beneficiaries reached with financial support to adopt CSA technologies (Number)		0.00	55,000.00
Farmers trained on the application of CSA technologies and practices (Number)		0.00	77,550.00
Farmers trained on the application of CSA technologies and practices, disaggregated by women (Number)		0.00	19,800.00
Extension staff/service providers trained on the use of CSA technologies and practices (Number)		0.00	3,274.00
Extension staff/service providers trained, disaggregated by women (Number)		0.00	915.00
Women benefiting from financing support provided by the project (Number)		0.00	13,700.00
Research and development (R&D) initiatives on sustainable and CSA technologies and/or practices implemented (Number)		0.00	39.00
Component 4: Project Management, Monitoring and Evaluation			
Project Monitoring Information System developed and operational (Percentage)		0.00	100.00
Share of project beneficiaries with rating ‘Satisfied’ or above with Citizen Engagement process (Percentage)		0.00	75.00

Monitoring & Evaluation Plan: PDO Indicators					
Indicator Name	**Definition/Description**	**Frequency**	**Datasource**	**Methodology for Data Collection**	**Responsibility for Data Collection**
Land area with integral information to develop sustainable and competitive agricultural land planning/management	Proposed climate indicator. This indicator measures in hectares the agricultural land area for which detailed information has been collected, processed and used to support decision making processes in the agricultural production planning.	Annually	National Soil/Land Information System.	This indicator is measured based on the number of hectares of agricultural land that has detailed information to make decisions on agricultural production planning/management. At a minimum, the following information per hectare of land will be considered: i) soil survey mapping (maps), ii) land use planning/plan notes, iii) soil physical and chemical characteristics and iv) thematic maps.	PCU, working closely with PIU at TRGM-M&E system
Increase in the analyses/tests for animal disease/zoonoses diagnostics processed	This indicator measures the improvement in laboratory	Annually after year 3	Project M&E System	The annual number of laboratory tests and/or	PCU, working closely with PIU at MoAF-

in the upgraded/constructed laboratories	capacity to perform testing for detection of priority animal diseases/zoonoses and emerging pathogens. This indicator is measured as a percentage increase (incremental increase) in capacity of laboratories to process analysis and testing as a direct result of project actions. The baseline figure is to be determined (TBD), when carrying out the detailed need assessment, during the first year of project implementation.			analyses as provided by the seven Veterinary Control Institutes, as the baseline at the beginning of the project, is compared to the number of tests and/or analyses performed each year during project implementation. This value is expressed in percentage. Calculation Formula: (Number of tests-analysis per year (accumulative) minus the number of test-analysis at baseline divided by the baseline) *100	GKGM -M&E system
Farmers adopting Climate-Smart Agricultural (CSA) technologies	Proposed climate indicator. This indicator measures the number of farmers who have adopted CSA technologies promoted by operations supported by the World Bank. Adoption refers to a change of practice or change in use of a	Annually (starting in year 3)	Survey	This indicator captures the number of farmers who have adopted CSA and will be measured conducting an annual representative survey of beneficiary farmers. Adoption rate will be estimated taking	PCU working closely with PIUs-/M&E system.

	technology that was introduced or promoted by the project. Technology includes a change in practices compared to currently used practices or technologies.			into consideration the following criteria: (i) there is clear evidence that direct beneficiaries use a technology promoted by the project independently and at their own discretion; (ii) the technology introduced by the project generates net benefits greater than those generated by traditional technologies; ; (iii) beneficiaries use the technology and apply the change of practice for a minimum of two consecutive production cycles; and (iv) the technology is replicated by indirect beneficiaries at the local level.	
Farmers adopting CSA technology - Female					
Farmers adopting improved agricultural	This indicator measures the	Annually	Survey	This indicator	PCU working closely

technology	number of farmers (of agricultural products) who have adopted an improved agricultural technology promoted by operations supported by the World Bank. NB: "Agriculture" or "Agricultural" includes: crops, livestock, capture fisheries, aquaculture, agroforestry, timber and non-timber forest products. Adoption refers to a change of practice or change in use of a technology that was introduced or promoted by the project. Technology includes a change in practices compared to currently used practices or technologies (seed preparation, planting time, feeding schedule, feeding ingredients, postharvest storage/ processing, etc.). If the project introduces or promotes a technology	(starting in year 3)		captures the number of farmers who have adopted CSA and will be measured conducting an annual representative survey of beneficiary farmers. Adoption rate will be estimated taking into consideration the following criteria: (i) there is clear evidence that direct beneficiaries use a technology promoted by the project independently and at their own discretion; (ii) the technology introduced by the project generates net benefits greater than those generated by traditional technologies; (iii) beneficiaries use the technology and apply the change of practice for a minimum of two consecutive production cycles; and (iv) the	with PIUs-M&E system.

	package in which the benefit depends on the application of the entire package (e.g., a combination of inputs such as a new variety and advice on agronomic practices such as soil preparation, changes in seeding time, fertilizer schedule, plant protection, etc.), this counts as one technology. Farmers are people engaged in farming of agricultural products or members of an agriculture related business (disaggregated by men and women) targeted by the project.			technology is replicated by indirect beneficiaries at the local level	
Farmers adopting improved agricultural technology - Female		Annually (starting in year 3)	Survey	This indicator captures the number of farmers who have adopted CSA and will be measured conducting an annual representative survey of beneficiary farmers. Adoption rate will be estimated taking into consideration the following criteria: (i)	PCU working closely with PIUs-M&E system

				there is clear evidence that direct beneficiaries use a technology promoted by the project independently and at their own discretion; (ii) the technology introduced by the project generates net benefits greater than those generated by traditional technologies; ; (iii) beneficiaries use the technology and apply the change of practice for a minimum of two consecutive production cycles; and (iv) the technology is replicated by indirect beneficiaries at the local level	
Farmers adopting improved agricultural technology - male		Annually (starting in year 3)	Survey	This indicator captures the number of farmers who have adopted CSA and will be measured conducting an annual representative	PCU working closely with PIUs-M&E system.

				survey of beneficiary farmers. Adoption rate will be estimated taking into consideration the following criteria: (i) there is clear evidence that direct beneficiaries use a technology promoted by the project independently and at their own discretion; (ii) the technology introduced by the project generates net benefits greater than those generated by traditional technologies; ; (iii) beneficiaries use the technology and apply the change of practice for a minimum of two consecutive production cycles; and (iv) the technology is replicated by indirect beneficiaries at the local level	

Monitoring & Evaluation Plan: Intermediate Results Indicators					
Indicator Name	**Definition/Description**	**Frequency**	**Datasource**	**Methodology for Data Collection**	**Responsibility for Data Collection**
Area with soil analysis and soil mapping performed	This indicator measures the hectares of land that will be sampled for soil physical and chemical analysis to determine soil characteristics and suitability, as well as the number of hectares with soil mapping based on soil surveys.	Biannual	Soil database	The hectares that have been sampled to perform soil analysis and determination of soil physical and chemical characteristics and are used to carry out the detailed soils mapping (1:5000) are counted.	PCU, working closely with PIU at TRGM-M&E system
Information and decision support sub-systems to narrow soil and land information gaps and/or support soil/land monitoring	Proposed climate indicator. This indicator measures the number of IT sub-systems or decision support tools related to soil and land information that are developed, optimized and/or integrated in the TAD Portal, to reduce information gaps, support land/soil monitoring for decision making processes for land use planning and conservation.	Biannual	TAD Portal	This indicator reports the number of tools and/or IT platforms/sub-systems in the soil/land information system housed in the TAD Portal that are developed, optimized and/or integrated to reduce information gaps and/or support land/soil monitoring for decision making processes. Based on evaluation processes during project	PCU, working closely with PIU at TRGM-M&E system

				implementation, the following information sub-systems could be reported under this indicator: i) National soil information, ii) National soil carbon information, iii) National soil monitoring, iv) Decision Support sub-system (DSS) for land planning, and v) other IT platforms/sub-systems that would be relevant to reduce the information gaps.	
Area where land notes have been prepared under the project	Proposed climate indicator. This indicator measures the area that has been classified as agriculture versus no agricultural uses (in land notes), based on international standard classifications and national categories established by Law.	Biannually	Soil and land information system	This indicator is reported on the basis of the hectares that have been classified and mapped according to international standard classifications.	PCU, working closely with PIU at TRGM-M&E system
Yield/production forecasting/warning models developed, piloted and under implementation	This indicator measures the number of forecasting models of production	Biannual	Project M&E System	This indicator is measured by counting the number of	PCU, working closely with PIU at BTGM

	variables developed for the main crops and animal production based on the combination of various sources of agricultural information contained in the information systems.			forecasting/warning models developed to estimate production variables of each crop and livestock using analytical data methodologies.	
Users of the information supported by the project that apply it to support decision making	Proposed climate indicator. This indicator measures the percentage of users of the national land and soil information in the TAD portal that use specialized soil and land data information to make decisions on agricultural land use.	Annually	National Soil/Land Information System	The number of requests to access/use specialized information from the national land/soil information in the TAD Portal for decision making are counted, in the following aspects: i) development of land-use and conservation plans, ii) investment plans in the non-agricultural sector, iii) investment plans in the agricultural sector, and iv) M&E of land use. Users are classified (but not exclusively) as follows: MoAF departments (national/central), other public institutions	PCU, working closely with PIU at TRGM-M&E system

				and councils, cooperatives/producer organizations, agribusiness companies, regional private organizations, research institutions, etc.	
Veterinary laboratory bio-safety level units (BSL 2) newly constructed or renovated and certified/approved to operate	This indicator measures the laboratory units that are upgraded to BSL2 or newly constructed BSL 2 Units as a result of project investments, and certified /approved to operate.	Annually	Project M&E System	The indicator is measured based on the number of laboratories units that are upgraded and approved/certified as BSL2 (including construction works, equipment, software, etc.) or any new constructed BSL 2 units as a result of project investments.	PCU, working closely with PIU at MoAF- GKGM - M&E system
Professionals from the network of animal health, veterinary institutes trained (including of the Veterinary Medicinal Control Center)	This indicator measures the project's intervention to strengthen the capacities of professionals from the animal health and veterinary service institutions as well as from provincial and district directorates for the	Biannual	Project M&E System	The number i) professionals of the institutions that are part of the network of biosafety laboratories and veterinary service that receive specialized training for the prevention,	PCU, working closely with PIU at MoAF- GKGM - M&E system

	prevention, surveillance, diagnosis and control of animal diseases. It also includes strengthen capacities of professionals from the newly established Veterinary Medicinal Control Center on specialized training needed for the operation of the center			surveillance, diagnosis and control of animal diseases as well as from provincial and district directorates, and ii) the number of professionals from the Veterinary Medicinal Control Center that receive specialized training are counted.	
Control Center for Veterinary Medicinal Products (VETKOM) established and in operation	The indicator measures the establishment and operationalization of the Veterinary Medicinal Products (VETKOM)	Annually	Project M&E System	This indicator measures the progress in the implementation and operation of the VETKOM considering the following steps and valuation: i) VETKOM needs and analysis of other facilities (5%), ii) Site selection and preparation of models and final design (5%/10% total accumulative), iii) Facility construction (45/55% accumulative total), iv) Installation and validation of equipment	PCU, working closely with PIU at MoAF- GDFC -M&E system

				(40%/95% accumulative total and vi) Selection of personnel and accreditation of facility: 5%/ 100% accumulative total.	
Veterinary laboratory bio-safety level (BSL 3) units newly constructed or renovated and certified/approved to operate	This indicator measures the laboratory units that are upgraded to BSL3 or newly constructed BSL3, and certified/approved to operate	Annually	Project M&E System	This indicator is to measured the number laboratory units that are upgraded to BSL3 (including construction work, equipment, software, etc.) and approved/certified to operate.	PCU, working closely with PIU GKGM -M&E system
Area prepared for climate-resilient greenhouse infrastructure	Proposed climate indicator. This indicator measures the agricultural area benefitting by construction of basic infrastructure for geothermal greenhouse production	Biannual	Project M&E System	The number of agriculture areas (ha) benefitting from construction of basic infrastructure for geothermal greenhouses.	PCU in closed coordination with PIU-TRGM/M&E System
Infrastructure and service provision models piloted and lessons for scaling-up consolidated.	Proposed climate indicator. This indicator measures the design and piloting of a cluster public-private collaboration model for scaling-up geothermal	Annually	Project M&E System	This indicator measures the design and piloting of a cluster public-private collaboration model for scaling-up geothermal greenhouse	PCU in closed collaboration with PIU-TRGM-M&E system

	greenhouse infrastructure; and of the model for manure management service provision.			infrastructure; and of the model for manure management service provision. The indicator will be achieved based on the consolidation of lessons emerging from the design & feasibility and implementation phases, and recommendations for further scaling up.	
Beneficiaries reached with financial support to adopt CSA technologies	Proposed climate indicator. This indicator measures the number of beneficiaries/clients that receive direct financing and training from the project to implement CSA technologies to be applied in different production system.	Biannual	Project M&E System	This indicator is counted taking into account the project beneficiaries directly supported by the project to implement CSA technologies in different productive systems. This indicator considers the following beneficiary (client) categories: Farmers, cooperatives/producer organizations and agri-business enterprises.	PCU working closely with PIU TRGM-M&E system.
Farmers trained on the application of CSA	Proposed climate and	Biannual	Project M&E	This indicator is	PCU working closely with

technologies and practices	gender indicator. This indicator measures the beneficiaries of training actions implemented by the project on topics related to the application of digital and CSA technologies/practices.		System	measured by counting the number of beneficiary farmers trained in the application of digital technologies and CSA and and good agricultural practices/integrated pest management systems.	PIUs-M&E system
Farmers trained on the application of CSA technologies and practices, disaggregated by women					
Extension staff/service providers trained on the use of CSA technologies and practices	Proposed climate indicator. This indicator measures the number of extension professionals who receive training on topics related to the application of digital and CSA technologies/practices	Biannual	Project M&E System	This indicator is measured by counting the number of extension service providers (public/private) trained in the application of digital technologies and CSA and and good agricultural practices/integrated pest management systems.	PCU working closely with PIUs-M&E system
Extension staff/service providers trained, disaggregated by women					

Women benefiting from financing support provided by the project	Proposed gender indicator. This indicator measures the percentage of women benefiting from financing support provided by the project. Women include female farmers, businesses owned by women, producer associations led by women. Financing is provided to support implementation of CSA technologies, including upgrading to resilient technology and infrastructure.	Biannual	Project M&E System	The percentage of women benefiting from matching grants/co-financing schemes with respect to the total number of initiatives financed by the project is counted. This includes women that are directly registered as beneficiary of the matching grant, that benefit through cooperative membership or that lead the implementation of the grant in the family household.	PCU working closely with PIUs-M&E system.
Research and development (R&D) initiatives on sustainable and CSA technologies and/or practices implemented	Climate Indicator. This indicator measures the project's support to the implementation R&D initiatives to generate, adapt or disseminate knowledge and/or climate-smart agricultural technologies and/or practices.	Biannual	Project M&E System	This indicator measures the project's support to the implementation of R&D initiatives to generate, adapt or disseminate knowledge and/or CSA technologies and/or practices.	PCU working closely with PIU-TAGEM/M&E system

Project Monitoring Information System developed and operational	This indicator measures the implementation of a monitoring and evaluation system to manage all information related to the project. This system will have a digital platform to manage all project information.	Biannual	Project M&E System	This indicator is reported by assessing the state of development and operation of the project's M&E software platform. The system must have at least four modules to manage project information properly for technical and administrative decision making: i) administration, ii) programming, iii) monitoring and iv) reporting.	PCU
Share of project beneficiaries with rating 'Satisfied' or above with Citizen Engagement process	Proposed Citizen Engagement indicator. This indicator measures the satisfaction level of the beneficiaries with the Citizen Engagement process by the project, disaggregated by gender.	Every two years	Project M&E System	This indicator is measured through the application of a representative survey to project beneficiaries, applied on-line or via phone. The level of satisfaction is estimated using a standard Likert scale based on a set of questions around the	PCU working closely with PIUs-M&E system

				following criteria: participation; perception of the quality of good and services; and perception of results or impacts.	

ANNEX 1: Implementation Arrangements and Support Plan

COUNTRY: Turkey
Turkey Climate Smart and Competitive Agricultural Growth Project (TUCSAP)

Implementation Arrangements

1. **Borrower and Implementing Agency**. The borrower of the IBRD Loan will be the Republic of Turkey, represented through the Ministry of Treasury and Finance (MoTF). The overall responsibility for project implementation, including management and coordination will lie with the Ministry of Agriculture and Forestry (MoAF), through the Project Implementing Units (PIUs). These are the General Directorate (GD) of Agricultural Reform (TRGM) (Subcomponents 1.1., 3.1, 3.2, and 3.3), the General Directorate of Food and Control (GKGM) (Component 2), the General Directorate of Agricultural Research and Policies (TAGEM) (Subcomponent 3.4), the General Directorate of Information Technologies (BTGM) (Subcomponent 1.2) and the General Directorate of EU and Foreign Relations (ABDGM) (Component 4). The implementing units (General Directorates-GDs) will bear the responsibility for the procurement arrangements of their investments, which will include drafting the TORs, technical specifications, bidding documents, and requests for proposals and also conducting the selection of consultants and procurement activities; signing, paying, and managing contracts; monitoring; and reporting and all other procurement-related activities, as specified in the Project Operations Manual (POM). MoAF will manage the Project Designated Account (DA) in the Central Bank and will be responsible for overall project reporting to the World Bank (WB), through the PCU.

2. **A Project Steering Committee (PSC) will be established to ensure effective coordination at a higher level and provide strategic advice.** The PSC will have participation of senior leadership of the General Directorate leading implementation of the subcomponents, including Deputy General Directors from the relevant GDs (TRGM, GKGM, BTGM, TAGEM, and ABDGM), as well as representatives of the related institutions. The PSC will be chaired by the line Vice Minister of the MoAF (to whom TRGM, and GKGM report), with the PCU acting as the Secretariat. The key functions of the PSC will be to review the annual workplans and budgets (AWPB), monitor implementation progress, ensure effective institutional coordination, and provide guidance as needed for ensuring the delivery of project outputs and achievement of project outcomes.

3. **A Project Coordinating Unit (PCU) responsible for overall project coordination will be established.** The PCU will be responsible for overseeing overall implementation and management of the project, ensuring proper application of all project-related requirements, and preparing all project documents to be submitted to the Bank. The PCU will be located at the GD of European Union (EU) and Foreign Relations (ABDGM). The PCU will host a dedicated multidisciplinary team of project management, technical, financial management, procurement, environmental, and social specialists with qualifications satisfactory to the Bank. PCU's functions are overseen by the leading Vice-Minister. The Project Director at the PCU will be supported by a PCU Coordinator, with solid experience implementing internationally funded projects, to be hired externally. The MoAF will establish the PCU by no later than sixty (60) days after the project Effectiveness Date. MoAF will also establish a transitional PCU responsible of coordinating project activities until the team at the PCU is fully in place.

4. **Project Implementation Units (PIUs)** will be established at each leading GD responsible for specific subcomponents: TRGM, GKGM, BTGM and TAGEM and will be responsible of overseeing project activities under their respective subcomponents and ensure effective engagement with MoAF's units and relevant stakeholders at the

Provincial level. PIUs will be created under each GD, if more than one department under the relevant GD is responsible for the implementation of project subcomponents, focal points will be appointed in each department, these focal points will report directly to the Deputy General Director, and will coordinate implementation closely with the PIU coordinator, hired externally or appointed from the internal staff by the respective Deputy General Director. The personnel designated as the focal point will also be responsible for following up the activities related to the subcomponent and accepted as the PIU staff. PIUs will be strengthened with technical experts, as needed, either through internal MoAF staff appointed or through external hiring.

5. **Technical Coordinating Committee (TCM**). To ensure close project coordination on a regular basis, a *Technical Coordinating Committee* (TCM) will be established and led by the PCU Director, with participation of focal points assigned for each subcomponent and relevant staff hired to support coordinating activities at the PIUs level. Committee members will meet periodically to review project progress based on monitoring and evaluation (M&E) results and will revise technical and administrative issues related to implementation. *Ad hoc Technical Committees* will be established for specific topics where strong alignment among MoAF's departments is required, including participation of departments that have not direct responsibility in the implementation of the project but that are direct beneficiaries of some of the activities or information generated by the project. These *ad hoc* technical committees can be established for a specific time period, as required, and will operate under a flexible framework. An *M&E technical working group* will be established permanently, to further refine the overall M&E strategy for the project and for coordinating its monitoring, including measurement approaches and strategies for data capture, reporting and evaluation. Each GD will assign a focal point (internal or hired externally) responsible for monitoring and evaluation aspects, which will be assigned to this working group.

6. **Detailed regional arrangements.** Activities under each subcomponent will be implemented in close coordination with Provincial Directorates (PD), Field Officers (FO) or Research Institutes (TAGEM)/Regional laboratories (GFCD) linked to the respective GDs at MoAF headquarters, and TDİOSB, as follows:

a) **TRGM** is responsible for the implementation of Subcomponents 1.1, 3.1, 3.2 and 3.3, managing more than half the total project investments.
   - **Subcomponent 1.1** activities will take place throughout the country. Procurement for the subcomponent will be carried out at the central level but the actual execution in the field and approval of the implementation will be carried out in close coordination with Provincial Directorates (see detailed description of the subcomponents in Annex 2). The payments for activities will be made at the central level.
   - **Subcomponent 3.1** will be implemented in close coordination with the selected Organized Industrial Zone(s) Based on Agriculture (TDİOSB), where the geothermal-based greenhouse infrastructure is to be located. MoAF/TRGM will enter into written subproject and sub-financing agreements with the beneficiaries TDİOSB (if more than one TDİOSB were to be selected). The beneficiary TDİOSB will prepare a Subproject Investment Plan (Subproject). Following approval by SBO and MoAF/TRGM of the proposed Subproject Investment Plan, and the Bank's no-objection, MoAF-TRGM will enter into a legally binding Subproject Agreement with the selected TDİOSB. Through the Subproject Agreement, MoAF will commit to the respective TDİOSB to provide financing to support the approved subproject, based on an estimate of the subproject costs. The Subproject Agreement will recognize that the exact amount of the financing for the subproject (i.e., sub-financing) will be determined after the TDİOSB has carried out the bidding processes (in line with the Bank's Procurement Regulations) for the subproject activities, and that the actual amount will be agreed on in a subsidiary sub-financing agreement. The Subproject

Agreement will require the TDİOSB to design, construct, carry out and operate the facilities financed under the project with due diligence and efficiency and in accordance with sound technical, financial and managerial standards, and the provisions of the World Bank Anti-Corruption Guidelines, and to maintain adequate records. In addition, the Subproject Agreement will require the selected TDİOSB to implement and operate the Subproject with due regard to applicable social impact, ecological, environmental and pollution control standards and in accordance with the environmental and social instruments prepared by the project. The Subproject Agreement will also stipulate that goods, works, non-consulting services and consulting services financed out of the proceeds of the sub-financing be used exclusively in the carrying out of the subproject activities. The beneficiary TDİOSB will also be obligated to take out and maintain insurance as per standard business practices, which, at a minimum, will insure against hazards incident to the acquisition, transportation and delivery of goods financed by the sub-financing to the place of use or installation. Should the selected TDİOSB (s) fail to perform any of its obligations under the Subproject Agreement, the MoTF, through MoAF, will have the right to suspend or terminate the use of the proceeds of the sub-financing. Following the conclusion of the bidding processes for the subproject activities, which will determine the actual amount of sub-financing to be extended, MoAF will enter into a Sub-financing Agreement with the selected TDİOSB. The Sub-financing Agreement will specify the total loan amount to be provided, including sub-loan/sub-financing conditions. MoAF will undertake close monitoring of subproject implementation, including site visits and requests for information from the TDİOSB.

- **Subcomponents 3.2 and 3.3** will be implemented with the support of MoAF's Provincial Directorates, where the subcomponent activities will take place. Geographical targeting, to be detailed in the POM will consider crop patterns, agricultural structure and expected benefits, within the framework of the assessment to be made at the beginning of the project. Procurement activities under Subcomponent 3.2 of the project shall be carried out by the eligible project beneficiaries through their well-established procurement arrangements stipulated in the Grant Manual.

b) **BTGM** is responsible for the implementation of Subcomponent 1.2. The implementation of this subcomponent will remain only at the central level.

c) **GKGM** is responsible for the execution of Component 2. The upgrade of provincial animal health laboratories and the establishment of the center of veterinary medicines control will be coordinated at the central level but implemented in close coordination with Provincial Directorates/MoAF affiliated provincial laboratory institutes.

d) **TAGEM** is responsible for the execution of Subcomponent 3.4. The activities related to the subcomponent will be coordinated at the central level, but the implementation and monitoring of the investments will be done by its Research Institutes spread throughout the country (see detailed description of the subcomponent in Annex 2) but the payments will be made at the central level.

e) **ABDGM will host the PCU**, which is responsible for Component 4 activities, which will be implemented at the central level.

7. Figure 1.1 below, illustrates the institutional arrangements for the project and Table 1.1 details the different Departments and responsibilities for project implementation.

Figure 1.1: Proposed project implementation structure

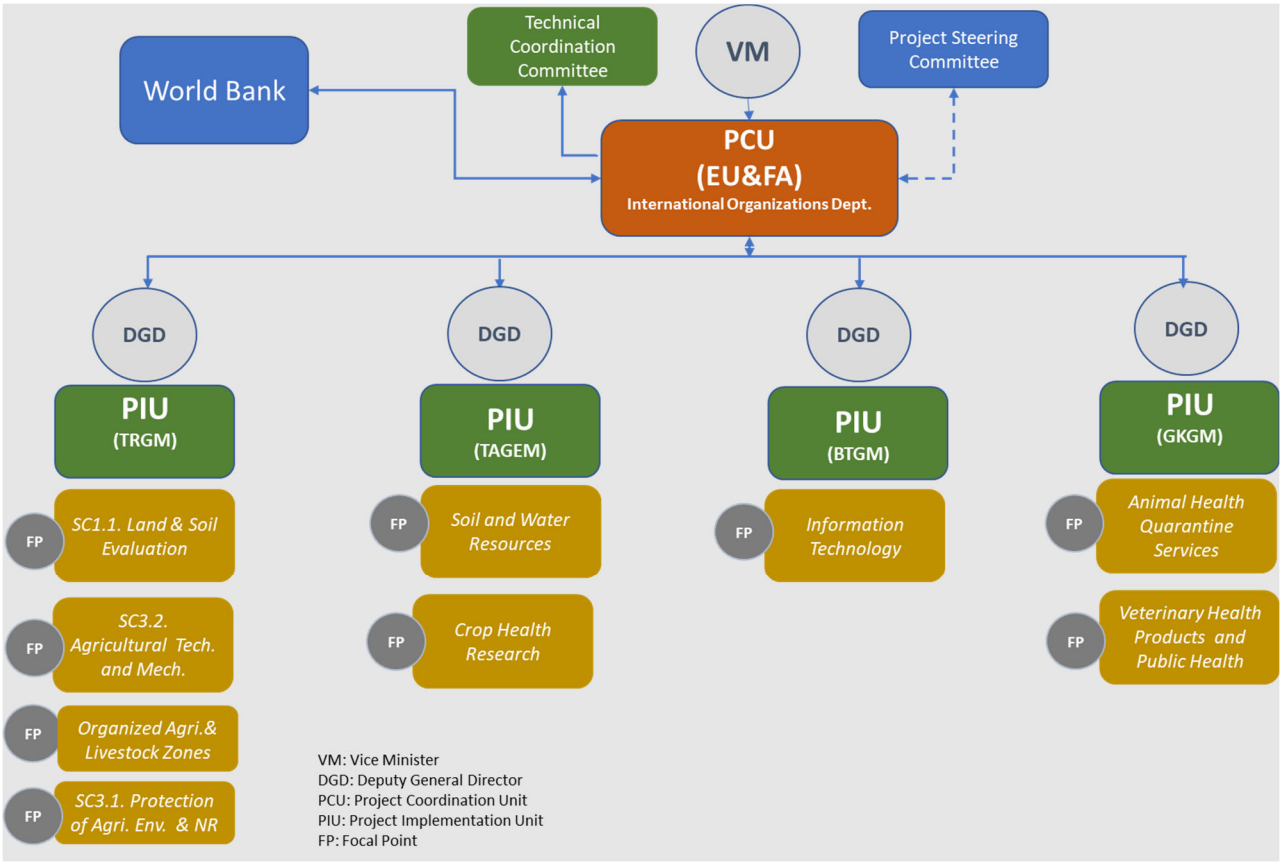


Table 1.1: Responsibilities of MoAF General Directorates (GDs)/Departments in project implementation

MoAF General Directorates	Department	Key Responsibilities
Leading Vice-ministry-Project Coordinating Unit (PCU)	The PCU is located at ABDGM reporting directly to the project's leading Vice-minister.	• The PCU Director, supported by the PCU Coordinator, is to be responsible for day-to-day project management and directly report to the Vice-minister. • Responsible for overall project coordination and management • Reporting to the WB on implementation progress, including technical, fiduciary, E&S, and M&E aspects. • Preparation AWPB in close coordination with PIUs.
General Directorate of Agricultural Reform (TRGM)	Soil Conservation and Land Evaluation Department	Leads the implementation of **Subcomponent 1.1. Narrowing information gaps to enhance soil health and land-use planning/management**
	Organized Agriculture and Livestock Zones Department	Leads the implementation of **Subcomponent 3.1. Strengthening climate resilience, productivity, and resource-use efficiency in horticultural production**
	Agricultural Technologies and Mechanization Department	Leads the implementation of **Subcomponent 3.2. Promoting the adoption CSA technologies/practices**

	Department of Protection of Agricultural Environment and Natural Resources	Leads the implementation of **Subcomponent 3.3**. **Reducing animal production pressures on water pollution and GHG emissions.**
General Directorate of Information Technologies (BTGM)	Department of Information Technology	Leads the implementation of **Subcomponent 1.2. MoAF digital blueprint for sectoral information collection and management** in close coordination with TRGM
General Directorate of Food and Control (GKGM)	Department of Animal Quarantine Services	Leads the implementation of **Subcomponent 2.1. Strengthening the capacity of animal health institutes**
	Veterinary Health Products and Public Health Department	Leads the implementation of **Strengthening and improving veterinary medicinal product controls for animal infectious and vector-borne diseases and zoonoses**
General Directorate of Agricultural Research and Policies (TAGEM)	Crop Health Research Department Soil and Water Resources Research Department	Leads the implementation of **Subcomponent 3.4. Research and innovations to support climate-smart agriculture in Turkey** Pesticide/Fertilizer/Nutrition Management Soil pillar/Climate assessments/water-carbon footprint

8. **Project Operations Manual (POM).** MoAF will implement the project based on a POM approved by the Bank. The POM will include: (i) detailed description of all project activities and prospective timetable and targets; (ii) detailed implementation arrangements and responsibilities (i.e., composition of and roles and responsibilities of PSC, and TORs for PCU, PIUs, etc.); (iii) detailed policies and procedures guiding the selection, implementation, and management of grant support packages (i.e., criteria for the prioritization, screening and selection of subprojects; technical guidelines for the selection and implementation of all grant packages, etc.); (iv) guidelines and arrangements for environmental and social requirements, including CE strategy; (v) arrangements and procedures for disbursements and financial management; (vi) applicable procurement rules and plans; (vii) Anti-Corruption guidelines; (viii) coordination mechanisms among relevant parties; and (ix) requirements and procedures for project monitoring, evaluation, reporting, and communication. The implementation arrangements outlined in the POM will adopt an adaptative management approach to allow to accommodate changes should the needs arise during implementation.

9. **Annual Workplan and Budget (AWPB).** A project AWPB will be prepared, consolidated, and finalized by the PCU every year in close coordination with the GDs responsible for implementing project components and subcomponents and reviewed during annual project meetings. An advanced draft will be sent to the World Bank and the PSC for comments and information. Once approved, MoAF will then include its respective AWPB in its Annual Investment Program with SBO and the procurement plan of the project. The detailed process for preparing, reviewing, and approving the AWPB will be further specified in the POM.

10. **Implementation modalities for grant support under Component 3.** The POM will outline the detailed policies and procedures for selecting and managing all grant activities under this component (Subcomponent 3.2). The PCU and TRGM-PIU, will develop a Grant Manual detailing the implementation arrangements for activities supported through matching grants with targeted beneficiaries. The preparation of the Grants Manual will be a disbursement condition and the Manual will be included as an Annex to the POM and will detail: (i) guidelines and criteria for the selection of beneficiaries; (ii) guidelines and criteria for the selection of specific technologies, to ensure alignment with the PDO; (iii) strategy for disseminating information, communicating and consulting with participating beneficiaries and relevant stakeholders based on the CE strategy; (iv) implementation mechanisms, including cost sharing requirements for the

different types of activities, grant application templates and instructions, grant agreement template, grant provision mechanisms, monitoring, evaluation, and reporting; (v) mechanisms for the execution of payments, accounting, documentation, internal controls and other financial management arrangements; (vi) Environmental and Social requirements, as per the project ESF and applicable standards; and (vii) procurement implementation arrangements.

11. **Implementation modalities for laboratory infrastructure, and infrastructure pilots/subprojects.** Under Component 2 the project will support infrastructure work to upgrade/construct new laboratory units, and new building construction for the establishment of a Veterinary Medicinal Control Center, under Subcomponent 3.1 the project will support basic infrastructure works to support greenhouse cluster vegetable production powered with geothermal resources, furthermore, and some other infrastructure investments are also expected under Subcomponent 3.3 around the third-party manure management facility. Prior to undertaken any work, the project will support feasibility analysis and E&S assessment. These investments will only take place if the results of such analysis are appraised and deemed satisfactory to the World Bank as per the Bank's requirements.

12. **Implementation Support Plan.** The World Bank will support project implementation in line with its procedures, standards, and requirements. The World Bank has put in place a task team comprising a diverse skill mix including from different Global Practices and external consultants, including Agriculture and Food, Environment, Water, Digital, etc. The skill sets required for continuous effective implementation support include, among others, project management, agriculture and agribusiness development, climate-smart agriculture experts, energy specialists, precision agriculture experts, M&E, procurement, financial management, communications, citizen engagement, environmental and social risks management, and legal. The Bank team will conduct technical due diligence, including reviewing specific investments and feasibility studies and/or planning reports, engineering design, tender packages, and E&S instruments. It is expected that implementation support by the Bank team will be more intense during the first two years of operation. Project Reports will be reviewed periodically by the World Bank as part of project implementation support missions to be carried out at least twice a year. Additional global expertise will also be sought to support the technical aspects of implementation.

Financial Management

13. The financial management arrangements of the project are Moderately Satisfactory. An action plan to bring these arrangements to an acceptable level at entry is presented at the end of this section. The MoTF will be the Borrower of the IBRD loan and allocate the proceeds to the MoAF in line with the Law on Public Finance and Debt Management No. 4749. In this context, the MoAF will be the responsible agency for the implementation of the project through its GDs involved, namely TRGM, GKGM, BTGM, TAGEM and ABDGM. These GDs will be the spending units and will apply the mechanisms set forth in the Public Financial Management and Control (PFMC) Law No. 5018 as well additional mechanisms as directed by the PCU to comply with the foreign borrowing requirements.

Investment Program and Budgeting

14. The MoAF is a general budget institution subject to the Public Financial Management and Control (PFMC) Law No. 5018. Accordingly, the project will follow the national planning and budgeting procedures and thus, can only make expenditures up to the ceiling indicated in the Investment Program for this project. The overall responsibility for budget preparation and monitoring lies with the Strategy Development Directorate (SDD) of MoAF. The investment budget of MoAF is prepared under the coordination of the SDD that is responsible for compiling the investment proposals of the spending units and preparing the final investment budget proposal of MoAF as a whole. SDD then sends the proposed

MoAF budget to the Presidency's Strategy and Budget Office in the third quarter of the year. Upon agreement, the institutional budget is then included in the general budget and becomes effective upon enactment of the Budget Law by the Turkish Grand National Assembly before the start of the new fiscal year. In line with the procedures described above and to be able to incur any expenditures in 2022, the MoAF would need to ensure the project is in the investment program and that the 2022 budgetary allocation for the project is enough under Budget Code 7 that indicate external/foreign resources for expenditures. Furthermore, the MoAF will ensure that sufficient funds are allocated in their annual budgets over the life of the project. For that purpose, the implementing GDs would need to send their project budget and investment program proposals to the PCU for coordination, consolidation, and monitoring.

Accounting System and Procedures

15. The MoAF is listed among Chart I institutions in the PFMC Law, and thus its accounting is maintained in the Integrated Public Information Management System of the MoTF in Turkish lira, in accordance with the chart of accounts predetermined by MoTF. As it is not possible to maintain the accounting in foreign currency in sufficient detail to enable detailed project reporting, the PCU, established within ABDGM, will maintain a separate accounting system to follow up the fund flows on a cash basis in foreign currency and to generate regular project financial reports.

16. For this purpose, the PCU will acquire an off-the shelf accounting and reporting software for project purposes. As a transitional measure, the accounting and reporting will be done using Excel spreadsheets until the software is tailored for the needs of the project and becomes operational, within two months after Project Effectiveness. The Procurement Plan includes the purchase of the software and the related services. A draft version of the accounting and reporting Excel spreadsheets will be prepared by Negotiations and finalized by Effectiveness; the software should be procured and tailored within the following two months. The PCU is expected to finalize the TORs for the accounting and reporting software before effectiveness to start the procurement process without delay.

17. The PCU started drafting a project Financial Management (FM) Manual for the project in coordination and cooperation with the spending GDs. The FM Manual will include (i) the financial and accounting policies and procedures for the project; (ii) organization of the FM unit, functions, staffing, and relevant job descriptions with special emphasis on the segregation of duties; (iii) the flows and templates for various transactions; (iv) disbursement procedures; (v) project budgeting, planning procedures, and financial forecasting; (vi) project reporting and auditing. A draft FM Manual will be prepared by loan negotiations and updated as necessary to reflect changes that may be required after the commencement of implementation.

Staffing

18. The PCU as well as the GDs involved will appoint at least one GD staff with adequate qualifications as the responsible for the financial management of the project. Considering the additional workload that will be brought by the project, MoAF plans to recruit at least two FM consultants at the PCU with TORs acceptable to the Bank, throughout project implementation. The procurement plan shall reflect MoAF's decision on the level of FM staffing and the consultants should be recruited within two months after effectiveness. The PCU is expected to finalize the TORs for the financial management consultants before effectiveness to start the procurement process without delay.

Internal Controls and Internal Audit

19. By no later than sixty (60) days after the Effective Date, the Borrower, through MoAF, shall have established and operationalized, and shall continue to maintain throughout Project implementation a Project Coordinating Unit with

operational structure to support E&S requirements. MoAF has already established a transitional PCU, which will be responsible of coordinating project activities, until the team at the PCU is fully in place. The PCU, through the authorized representatives, will be responsible for the disbursement arrangements from the Loan account to the DA in line with the Disbursement and Financial Information Letter which is part of the Negotiations package.

20. MoAF applies the internal control mechanisms set forth in the PFMC Law. Accordingly, the involved GDs will be the accountable spending units and will utilize the project funds in line with the agreed project documents. The GDs will be responsible for all stages of procurement, as well the verification of the receipt of goods and services and preparation of supporting documentation for payments. The GDs will also be responsible for submitting the payment orders with the supporting documents to the MoAF's Accounting Officer (Sayman) after an initial review and confirmation provided by the PCU FM Unit through the assignment of a transaction number. Detailed procedures will be described in the FM Manual. Upon receipt of PCU confirmation, the payment orders will be signed by the authorized personnel and all documentation, including authorizations, acceptances, and approvals for payment, to the FM Specialists in the GDs' own Budget Units (BU). The BUs will prepare the payment orders/bank transfer orders for execution of payments. Copies of the documents submitted to the “Sayman” will also be provided to the PCU simultaneously.

21. The “Sayman” will execute basic controls on the payment orders and will send them to the Central Bank of the Republic of Turkey (CBRT) for processing from the DA. The related Turkish Lira accounting entry to the Integrated Public Financial Management system in line with national regulations will be made by the “Sayman” based on the approved payment order. Besides, the expenditures in the proposed project will be subject to pre-financial control as per the pre financial control directive of MoAF, if any. A parallel project accounting will be maintained by the PCU on a cash basis in foreign currency and sufficiently detailed project financial reporting. All procedures and workflows will be described in the FM Manual, the draft of which will be prepared by Negotiations and finalized by project effectiveness.

22. Subcomponent 3.1 will be implemented by TRGM through a sub-financing provided to one or two selected TDIOSBs as per the implementation regulation issued, based on Law No. 4562 on Organized Industrial Zones. Accordingly, the approved TDIOSB Subproject will be included in the investment program and TRGM will ensure to have a corresponding allocation in its budget. TDIOSB will enter into a contractual agreement with the contractor and will have responsibility for the proper implementation of the contract under the monitoring of TRGM. For approved expenditures, documented with progress reports prepared by TSOIB and verified by the supervision consultant as well as TRGM. TRGM will transfer the amounts due to the contractor from the Designated Account of the project to the special subproject account of TDIOSB that will be opened in a bank acceptable to the Bank. The TDIOSB will make the payment to the contractor and submit payment documentation to TRGM. TRGM will be responsible for providing copies of all these documents to the PCU FM Unit for project accounting files. The procedures and flows relating to the financial management aspects of Subcomponent 3.1 will be documented in the FM Manual. The project will include matching grants in Subcomponents 3.2 implemented by TRGM. All the internal control procedures, documentation, workflows, coordination mechanisms with the provincial directorates, fund flows, accounting, reporting and auditing mechanisms will be detailed in a "Grants Manual" that will be a disbursement condition for the matching grants subcomponent.

23. MoAF has an Internal Audit Department. The Internal Audit Department is responsible for auditing selected processes of the whole Ministry based on their risk analyses and annual audit plans. For that reason, the project will not use the internal audit function of MoAF but consult them during implementation.

Reporting and Monitoring

24. The PCU will maintain records and will ensure appropriate accounting for the funds provided on a cash basis. The interim un-audited financial reports (IFRs) will be prepared quarterly and will be submitted to the Bank no later than 45 days after the end of the quarter through the Client Connection system of the Bank. The format and the contents of the IFRs will be agreed upon with the Bank and attached to the Minutes of Negotiation.

25. The IFRs will include the following reports at a minimum:

- Project Balance Sheet;
- Expenditure tables per activity, including explanation of significant variances between budgeted and actual figures;
- Expenditure tables per category, including explanation of significant variances between budgeted and actual figures;
- DA statement; and
- Contract management tables.

External Audit

26. As part of the Bank's auditing requirements, the project financial statements will be subject to external auditing. The first set of audit reports will be submitted to the Bank before June 30th of the year following the calendar year in which the first disbursement from the loan or grant has been made. Annual project financial statements will be audited by the Treasury Controllers based on the International Standards on Auditing and in line with a term of reference acceptable to the World Bank. The audit reports, including a Management Letter (ML) providing recommendations for improving implementation, will be provided to the World Bank within six months of the end of each fiscal year. The audit reports, excluding the ML, will be publicly disclosed by the PIU and the World Bank in line with the Bank's Access to Information Policy. The following table summarizes the audit requirements for the project:

Table 1.2: Project audit reports and due dates

Audit Report	Due Date
Project financial statements	Within six months of the end of each fiscal year and at the closing of the project

Funds Flow and Disbursement Arrangements

27. MoAF, through the Ministry of Treasury and Finance, will open a DA in the currency of the loan at the Central Bank of Turkey. Payments to the contractors, suppliers and consultants will either be made directly from the loan account or from the DA with the authorization of the responsible personnel. Advances should be requested to the DA based on project needs and planned project expenditures. All movements in this account will correspond to documented project income or expenditures. Two signatures indicated in the list of authorized signatures submitted by MoAF/PCU will be required on the withdrawal applications.

28. Disbursements from the Loan Account will follow the transaction-based method, i.e., traditional World Bank procedures: Advances, Direct Payments, Special Commitments and Reimbursement (with full documentation and against Statements of Expenditures (SOEs). The withdrawal applications will be prepared and authorized by the PCU.

29. A detailed Disbursement and Financial Information Letter (DFIL) will be provided to the MoAF. The

disbursements below specific thresholds indicated in the DFIL will be made according to Statements of Expenditures (SOEs). Full documentation in support of SOEs would be retained by MoAF for at least seven years after the Bank has received the audit report for the fiscal year in which the last withdrawal from the Loan Account was made. This information will be made available for review during supervision by World Bank staff and for annual audits which will be required to specifically comment on the propriety of SOE disbursements and the quality of the associated record-keeping.

Overall Conclusion

30. The overall FM risk is **Substantial** and the FM arrangements are moderately satisfactory. The following action plan is identified at this stage:

Table 1.3: Project financial commitments

Action	Responsibility	Deadline
The project will be included in the 2022 investment plan and the required budget allocations will be made on an annual basis	MoAF PCU in collaboration with participating GDs and SDD	Per national budgeting deadlines applied to general budget institutions
A draft FM Manual will be prepared	MoAF PCU in coordination with GDs	By Negotiations
Spreadsheets for temporary accounting and reporting	MoAF PCU	By Negotiations
The templates for the interim un-audited financial reports will be prepared	WB and MOAF PCU	By Negotiations
Terms of Reference for the accounting software will be prepared for immediate procurement after effectiveness	MoAF PCU	After loan signing
Terms of Reference for Financial Management Consultants will be prepared for immediate procurement after effectiveness	MoAF PCU	After loan signing
Authorization procedures for disbursements will be completed	MoAF PCU in coordination with MoTF	After effectiveness
FM consultants recruited and the FM system procured and tailored	MoAF PCU	At implementation, no later than two months after effectiveness
The FM Manual will be finalized	MoAF PCU	No later than two months after effectiveness
Grant Manual (as a subcomponent of the POM)	MoAF PCU in collaboration with TRGM PIU	Prior to execution of grants schemes (disbursement condition for specific subcomponent)

31. During project implementation, the Bank will supervise the project's financial management arrangements in two main ways: (i) reviewing the project's interim unaudited financial reports, project's annual audited financial statements, and auditor's management letter; and (ii) during the Bank's supervision missions, reviewing the project's financial management and disbursement arrangements (including a sample of SOEs and movements on the DA) to ensure compliance with the Bank's minimum requirements. The frequency of these visits will be determined in accordance with the project's risk rating, which will be monitored over its lifetime. The supervision missions will also

include site visits to monitor physical progress, compared with the financial information.

Procurement

32. **Applicable Procurement Regulations**. The World Bank Procurement Regulations for IPF Borrowers – November 2020 ("Procurement Regulations") will apply to the project. A General Procurement Notice (GPN) will be published on the World Bank's external website and the United Nations Development Business online immediately after the project negotiations.

33. **Anticorruption Guidelines.** The Bank's 'Guidelines on Preventing and Combating Fraud and Corruption in Projects Financed by IBRD Loans and IDA Credits and Grants' (revised as of July 01, 2016) ("Anticorruption Guidelines") will apply to the project.

34. **Project Procurement Strategy for Development (PPSD).** The PCU developed the PPSD in coordination with the participating GDs pursuant to paragraphs 4.1 and 4.2 of the Procurement Regulations. The PPSD has been agreed upon by the Bank and will be recorded in the project files after the loan negotiations. The PPSD describes how procurement activities support project operations for achieving the PDO and deliver value for money. The PPSD is linked to the overall project implementation strategy by ensuring proper sequencing of procurement activities. It describes the institutional arrangements of all participating GDs for procurement activities, including roles and responsibilities, proposed thresholds and procurement methods, prior reviews, and other requirements needed for carrying out procurement. The PPSD also includes a detailed description of the capacity needed by the GDs for carrying out procurement, with a specific focus on managing contract implementation, governance structure, and accountability framework. In addition, the PPSD is supported by market research and analysis assessing market-related risks and opportunities that will affect the preferred procurement approach and strategy. The PPSD discusses the GDs' procurement implementation arrangements and concludes with an initial Procurement Plan for the first 18 months of the project. Grant-related investment contracts will be included in the Procurement Plan once they are approved by the Bank in accordance with the eligibility criteria specified in the POM and the Grant Manual. The initial potential list of contracts in the Procurement Plan includes their cost estimates, selection methods, review procedures, and envisaged time frame according to paragraph 4.4 of the Procurement Regulations. It is not possible to identify the individual procurement packages at this stage for contracts under the small matching grant schemes of Subcomponent 3.2 due to their demand-driven nature. The procurement arrangements for the small grant schemes will be detailed in the Grant Manual agreed by the Bank with due consideration to acceptable commercial practices of the grant beneficiaries.

35. The PPSD confirmed that the commercial procurement practices of small firms, groups of people, cooperatives and individuals in Turkey follow the general rule that they procure the least cost goods, works, and services consistent with acceptable quality requirements. The Bank has provided financing to various credit line operations in Turkey in which the end users were private sector firms or individuals. All such Bank-financed credit line projects confirmed that the funds were used by the beneficiaries for the intended purposes, with due consideration of economy and efficiency. Thus, in the case of any procurement that shall be carried out by the beneficiaries under Subcomponent 3.2 of the project will be done in accordance with well-established commercial practices as stipulated in the Grants Manual and confirmed by TRGM that these practices are consistent with the Bank's Core Procurement Principles of value for money, economy, integrity, fit for purpose, efficiency, transparency, and fairness. TRGM will oversee the procurements done by the beneficiaries.

36. Under Subcomponent 3.1, the selected specialized greenhouse (geothermally heated) TDİOSB (or TDİOSBs, if more than one were to be selected) will prepare and submit a Subproject Investment Plan (Subproject) along with the PPSD prepared for the contracts envisaged under each individual subproject. The Subproject Investment Plan, including the PPSD and resulting procurement plan will be submitted to MoAF-TRGM and SBO approvals, and for Bank's non-objection prior to subproject implementation. MoAF-TRGM will conduct procurement assessment of the selected TDİOSB, identifying risks and mitigation measures for implementation and procurement arrangements of the subproject. The TDİOSB will conduct the procurement activities under its investment plan (Subproject), when requested by the TDİOSB, TRGM will provide hands-on support to the TDİOSB in conducting subproject's procurement with consideration given to avoid any conflict of interest. The procurement contracts, under the investment plan (Subproject) will be signed by the TDİOSB and the contractor. TDİOSB will be responsible for the contract implementation and the payments to the contractors. TRGM will provide close monitoring and will verify compliance of requirements before payments by the TDİOSB can proceed.

37. Based on the PPSD, except the critical contracts under Subcomponent 1.1 and Subcomponent 2.2 which are at the international level, the majority of the contract sizes will be small or medium scale, and the monetary value of the procurements will be within the national procurement thresholds. Considering the estimated sizes and types of the contracts, such procurements are expected to be advertised at the national level. Additionally, it is envisaged that the language of the bids will be Turkish. The Turkish translation of the Bank's Standard Procurement Documents (SPDs) with minor modifications will be used as fit for purpose. For the procurement of goods, works, consulting services and non-consulting services that will be advertised at the international level, the Bank's SPDs will be used in English.

38. The investments included in the PPSD and potential list of contracts considered for the first 18 months of the project were determined by the GDs as priorities among all the investments planned. Supplementary PPSDs will be prepared for additional activities/procurements identified after the completion of the Feasibility Plans as in the Case of Subcomponent 1.2. No procurement process shall be initiated before the approval of the relevant E&S studies by the Bank and if needed, preparation of the supplementary PPSDs for activities that involves/require preparation of E&S studies. The hiring of the individual experts required for the PCU and PIUs will be conducted by the GDs following the individual consultant selection procedures specified in the Procurement Regulations. These include, but may not be limited to, procurement specialist/s, financial management specialist/s, social development specialist(s), environmental specialist(s), and relevant technical experts.

39. **Procurement Plan and procurement tracking.** Paragraph 5.9 of the Procurement Regulations requires the Borrower to use the World Bank's Systematic Tracking of Exchanges in Procurement (STEP), an online procurement tracking tool for preparing, clearing, and updating its Procurement Plans and conducting all procurement transactions. The PCU/PIUs will create the Procurement Plan through STEP before initiating any procurement activity. The PPSD and the underlying Procurement Plan will be updated at least annually or as required to reflect the actual project implementation needs. The Procurement Plan and its updates shall be subject to the Bank's review and approval. A list of procurements that may be performed by beneficiaries under Subcomponent 3.2 will be recorded in a format agreed by the Bank and specified in the Grants Manual, and these records will be uploaded into STEP by the TRGM PIU at least annually. All the procurement-related complaints will be recorded in the STEP complaint module by the GDs. The critical contracts in terms of their value and risks, agreed by the Bank, for financing of the project are listed in Table 1.4.

40. **Advance procurement**. Procurement Regulations Paragraphs 5.1 and 5.2 (Advance Contracting and Retroactive Financing) permits the GDs, if they wish, to proceed with the procurement process before signing the Legal Agreement. In such cases, for the eventual contracts to be eligible for World Bank financing, the procurement procedures, including

advertising, shall be consistent with Sections I, II, and III of the Procurement Regulations, which cover the Bank's Core Procurement Principles of economy, efficiency, transparency, fairness, fit-for purpose, value for money, and integrity. With this understanding, the PCU may initiate the selection of PIU consultants immediately after project negotiations upon the publication of the GPN.

Table 1.4: Identified Major Contracts Agreed by the Bank

Activity Description	Reference No	Procurement Category	Procurement Method	Market Approach	Review Method	Estimated procurement Notice/ Invitation Date	Estimated Contract Signing Date	Estimated Contract Completion Date
Group I Soil Surveys and Classification; Laboratory Analysis; Production of digital detailed soil maps (1:5000)	NCS.TRGM.CS1.1 -01	NCS	Request for Bids (RFB)	Open - National	Prior	May.22	Jul.22	Jan.24
Group II Soil Surveys and Classification; Laboratory Analysis; Production of digital detailed soil maps (1:5000)	NCS.TRGM.CS1.1 -02	NCS	Request for Bids (RFB)	Open - National	Post	Jan.23	Mar.23	Sep.24
Group III Soil Surveys and Classification; Laboratory Analysis; Production of digital detailed soil maps (1:5000)	NCS.TRGM.CS1.1 -03	NCS	Request for Bids (RFB)	Open - National	Post	Jan.24	Mar.24	Sep.25
Group IV Soil Surveys and Classification; Laboratory Analysis; Production of digital detailed soil maps (1:5000)	NCS.TRGM.CS1.1 -04	NCS	Request for Bids (RFB)	Open - National	Post	Nov.24	Jan.25	Jul.26
Group V Soil Surveys and Classification; Laboratory Analysis; Production of digital detailed soil maps (1:5000)	NCS.TRGM.CS1.1 -05	NCS	Request for Bids (RFB)	Open - National	Post	May.25	Jul.25	Jan.27
Group VI Soil Surveys and Classification; Laboratory Analysis; Production of digital detailed soil maps (1:5000)	NCS.TRGM.CS1.1 -06	NCS	Request for Bids (RFB)	Open - National	Post	Nov.25	Jan.26	Jul.27
Group VII Soil Surveys and Classification; Laboratory Analysis; Production of digital detailed soil maps (1:5000)	NCS.TRGM.CS1.1 -07	NCS	Request for Bids (RFB)	Open - National	Post	Apr.26	Jun.26	Dec.27
Group VIII Soil Surveys and Classification; Laboratory Analysis; Production of digital detailed soil maps (1:5000)	NCS.TRGM.CS1.1 -08	NCS	Request for Bids (RFB)	Open - National	Post	May.26	Jul.26	Jan.28
Group I - Preparing Plans/Notes and Land Classification	CS.TRGM.CS1.1-01	CS	Quality and Cost-based Selection (QCBS)	Open - International	Prior	Sep.22	May.23	May.25

Activity Description	Reference No	Procurement Category	Procurement Method	Market Approach	Review Method	Estimated procurement Notice/ Invitation Date	Estimated Contract Signing Date	Estimated Contract Completion Date
Group II - Preparing Plans/Notes and Land Classification	CS.TRGM.CS1.1-02	CS	Quality and Cost-based Selection (QCBS)	Open - International	Prior	Mar.23	Nov.23	Nov.25
Group III - Preparing Plans/Notes and Land Classification	CS.TRGM.CS1.1-03	CS	Quality and Cost-based Selection (QCBS)	Open - International	Prior	Sep.23	May.24	May.26
Group IV - Preparing Plans/Notes and Land Classification	CS.TRGM.CS1.1-04	CS	Quality and Cost-based Selection (QCBS)	Open - International	Prior	Mar.24	Nov.24	Nov.26
Group V - Preparing Plans/Notes and Land Classification	CS.TRGM.CS1.1-05	CS	Quality and Cost-based Selection (QCBS)	Open - International	Prior	Sep.24	May.25	May.27
Group VI - Preparing Plans/Notes and Land Classification	CS.TRGM.CS1.1-06	CS	Quality and Cost-based Selection (QCBS)	Open - International	Prior	Mar.25	Nov.25	Nov.27
Group VII - Preparing Plans/Notes and Land Classification	CS.TRGM.CS1.1-07	CS	Quality and Cost-based Selection (QCBS)	Open - International	Prior	Aug.25	Apr.26	Apr.28
Group VIII - Preparing Plans/Notes and Land Classification	CS.TRGM.CS1.1-08	CS	Quality and Cost-based Selection (QCBS)	Open - International	Prior	Aug.25	Apr.26	Apr.28
Construction Works for Geothermal Heating System Geothermal drillings, Installation and Commissioning of the Well Equipment, Geothermal pipelines and the Heating Plant) for Pilot Project in Specialized Greenhouse TDİOSB (Geothermal Sourced)	W.TRGM.CS3.1-01	W	Request for Bids (RFB) Small Works	Open - National	Post	Sep.23	Nov.23	Nov.25
Infrastructure Works (Irrigation, Sewerage and Rainwater Networks, Road Construction, Electricity, Telecommunication and Natural Gas Networks and etc.) for Pilot Project in Specialized Greenhouse TDİOSB (Geothermal Sourced)	W.TRGM.CS3.1-02	W	Request for Bids (RFB) Small Works	Open - National	Post	Jan.24	Mar.24	Sep.25

Activity Description	Reference No	Procurement Category	Procurement Method	Market Approach	Review Method	Estimated procurement Notice/ Invitation Date	Estimated Contract Signing Date	Estimated Contract Completion Date
Design, Supply & Installation of Biogas Unit, Energy Production Unit and Fertilizer Production Plant	W.TRGM.CS3.3-01	W	Request for Bids Plant (Design, Supply and Installation Single Stage without Prequalification	Open - National	Post	Jan.24	Apr.24	Apr.26
Group 1- Design, Supply and Installation of BSL 2 and BSL 3 Labs in Adana VCI	W.GDFC.CS2.1-01	W	Request for Bids Plant (Design, Supply and Installation Single Stage without Prequalification)	Open - National	Post	Mar.23	May.23	Nov.25
Group 2- Design, Supply and Installation of BSL 2 and BSL 3 Labs in Konya VCI								
Group 1- Design, Supply and Installation of BSL 2 and BSL 3 Labs in Elazig VCI	W.GDFC.CS2.1-02	W	Request for Bids Plant (Design, Supply and Installation Single Stage without Prequalification)	Open - National	Prior	May.23	Jul.23	Jan.26
Group 2- Design, Supply and Installation of BSL 2 and BSL 3 Labs in Erzurum VCI								
Group 3- Design, Supply and Installation of BSL 2 and BSL 3 Labs in Samsun VCI								
Group 1 - Design, Supply and Installation of BSL 2 and BSL 3 Labs in Istanbul Pendik VCI	W.GDFC.CS2.1-03	W	Request for Bids Plant (Design, Supply and Installation Single Stage without Prequalification)	Open - National	Post	Aug.23	Oct.23	Apr.26
Group 2 - Design, Supply and Installation of BSL 2 and BSL 3 Labs in Izmir Bornova VCI								
Design, Supply & Installation Contract for VETKOM	W.GDFC.CS2.2-01	W	Request for Bids Plant (Design, Supply and Installation Single Stage without Prequalification)	Open - International	Prior	Oct.23	Dec.23	Jun.27
GO: Goods CS: Consulting Services NCS: Non-Consulting Services W: Works								

41. **Procurement risk assessment.** The World Bank has conducted a procurement assessment for the project, with

a focus on MoAF in terms of: (i) procurement regulatory framework and management capability; (ii) integrity and oversight; (iii) procurement process and market readiness; and (iv) procurement complexity. While the Procurement Regulations will apply in the project, the assessment concludes that (i) applicable procurement policies and the regulatory system are designed broadly to meet Core Procurement Principles of value for money, economy, efficiency, effectiveness, integrity, transparency and fairness and accountability; (ii) MoAF has a clear system of accountability with clearly defined responsibilities and delegation of authority on who has control of procurement decisions; (iii) there is a clear identified target market for all procurements; and (iv) MoAF effectively manages contracts to ensure delivery as per the contract conditions. The assessment was recorded in the Procurement Risk Assessment and Management System of the Bank.

42. The PCU will be considered as the focal point for communication with the World Bank. It is envisaged that at least four procurement specialist/s (two of them will serve to TRGM activities, one to GKGM activities and one to support procurement transversally across the project) will be employed within the PCU to provide technical assistance and hands-on procurement implementation support to PIUs. In addition, when needed, the PIUs of each GD will be supported by experienced staff in public procurement through their internal assignment to the project.

43. Given the complexity of the project and the GDs' limited familiarity with Bank procurement procedures, the project's overall procurement risk is assessed as **Substantial**. The risk rating can be lowered to Moderate when the agreed actions in Table 1.5 below have been completed.

Table 1.5: Identified Risks and Agreed Action Plan

	Identified Risk	Mitigation Measure	Responsible Party	Time Frame
1	PCU/PIUs staff are not familiar with the World Bank Procurement Regulations. It may cause noncompliance and delay in procurement activities	MoAF will maintain a dedicated PCU within the MoAF and PIUs in each implementing DGs. The PCU will recruit at least four procurement specialists experienced in the procurement procedures of International Financial Institutions, preferably the World Bank. The GDs will assign procurement staff from their current qualified staff.	MoAF (All implementing GDs)	The TOR/s for Procurement Specialist/s will be prepared by ABDGM for immediate procurement after effectiveness. The signing of contracts for procurement specialists will be done no later than two months after effectiveness.
2	Potential delays in the procurement process due to limited familiarity of the PIUs' bid evaluation committee members with World Bank procurement process.	The procurement specialist/s in the PCU will arrange trainings on World Bank Procurement Regulations for the PIUs' bid evaluation committee members.	MoAF PCU	Throughout the project.
3	The fact that procurement functions will be carried out both at the central and provincial/research institute level may force the integrity of the implementation.	Procurement specialists at PCU should work closely with the Provincial Directorates/ research institutes to be involved in the implementation and provide the necessary training and support regarding	MoAF PCU	Throughout the project.

	Identified Risk	Mitigation Measure	Responsible Party	Time Frame
		procurement, including contract management functions.		
4	Differences in procurement implementations may create unnecessary questions from the procurement stakeholders.	Develop a Project Operations Manual with a procurement section for project implementation	MoAF (PCU, and all other implementing GDs)	Before project effectiveness.
5	Incomplete environmental and social studies may delay the commencement of contract implementation.	All environmental and social studies will be completed before the initiation of procurements and/or signing of contracts.	MoAF (PCU, and all other implementing GDs)	Throughout the project.
6	Contract deliverables may not be used for the intended purposes by the beneficiaries under small grant schemes.	TRGM will conduct physical reviews of the procured items to ensure that they will be used for the intended purposes. In addition, TRGM will verify the quality of the procured goods, works and services and the consistency of the contract prices with the market prices through an independent third-party consultancy contract, and will report to the Bank semi-annually.	MoAF TRGM	Throughout the project.
7	Misinterpretation of the Procurement Regulations and terms and conditions of the contracts may cause non-compliances, and delays in the contract schedule and cost overruns in contract implementation.	Procurements conducted by the PIUs will be reviewed by the PCU. The PCU will work closely with World Bank Procurement Specialist.	Throughout the project.	Throughout the project.
8	COVID-19 Pandemic will impact procurement processes	Special procurement arrangements to address this risk will be applied as deemed appropriate in the POM and introduction of changes in the procurement strategy.	MoAF (PCU, and all other implementing GDs)	Throughout the project.

44. **Bank review of procurement transactions**. The World Bank will review the GDs' procurement arrangements, including contract packaging, applicable procedures, and scheduling of procurement processes, for their conformity with the Legal Agreement. Those procurements that did not have ex-ante due diligence by the World Bank will be subject to ex-post due diligence on a sampling basis per the procedures set forth in Paragraph 4 of Annex II to the Procurement Regulations. The World Bank will typically undertake annual post reviews of the procurement documents during its supervision missions, or it may request to review any particular contract at any time. In such cases, the PCU/PIUs shall provide the World Bank the relevant documentation for its review. The PCU/PIUs will keep complete and up-to-date records of all procurement documentation and relevant correspondences, which will be reviewed by

Bank staff during implementation support missions. Procurement and contract management monitoring reports will be submitted semi-annually as an integral part of the reporting on project implementation.

45. **Complaint review.** The procurement complaints, other than those covered under Annex III of the Procurement Regulations, are to be handled by the DGs following the procedures agreed by the Bank and stipulated in the POM. Immediately upon received, the complaints will be recorded in the STEP complaint module by the PCU/PIUs. The GDs will not proceed with the next stage of the procurement process, including contract awarding, without satisfactory resolution of the complaint(s). Such complaints will be addressed by the PCU/PIU within a reasonable time but not later than 15 business days of complaint receipt.

46. Operational costs will not be considered under WB procurement implementation. Such operational costs are reasonable incremental expenses directly incurred on account of the implementation, management, and monitoring of the project by the DGs. Such costs may include, as relevant and as the Bank agrees, for the following: (i) travel, accommodation, and per diem associated with training, workshop, and study tour for participants and trainers, and other training related miscellaneous costs; (ii) office supplies; (iii) office rental; (iv) vehicle rental; (v) office and equipment maintenance and repair; (vi) communications; (vii) translation and interpretation; (viii) travel for project supervision; (ix) publication & subscription fees; (x) ownership of intellectual property rights; and (xi) other miscellaneous expenses directly associated with the project and agreed between the Bank and MoAF.

ANNEX 2: Detailed Project Description

COUNTRY: Turkey
Climate Smart and Competitive Agricultural Growth Project

1. The six-year Turkey Climate-Smart and Competitive Agricultural Growth Project will be funded by a US$341.27 million IBRD IPF loan. The PDO is to strengthen capacity for sustainable and competitive agricultural growth and promote the use of climate-smart agriculture in targeted regions in Turkey. The project will support the agricultural sector in transitioning toward a more sustainable, competitive and climate smart orientation by enhancing institutional capacity through narrowing information gaps in relation to Turkey's soils and land natural capital, to enhance its sustainable planning and management; improving data collection and information management to support smart policy monitoring; and improving capacity for animal disease surveillance and diagnostic and for control and regulation of veterinary medicines/vaccines. It will also support innovation and the use of CSA technologies and practices by farmers and agricultural enterprises.

2. The project supports the vision of an agri-food sector in Turkey that is sustainable and competitive and, increasingly global and connected to key markets, digital and climate-smart, in line with priorities highlighted in national and sectoral plans. It pushes forward GoT efforts to move the sector into a trajectory of green growth and proactively responds to policy developments in key export markets, such as the EU Green Deal. It makes data and dissemination of information a key tool to support stakeholder's decisions and drive sustainable outcomes in the sector. It enhances the role of technologies, RD&I to scale-up climate action to deliver triple wins in terms of sustainability, resilience, and productivity. It strengthens surveillance and diagnostic capacities around key animal diseases, which are critical to manage increasing disease risks, exacerbated by climate change, and ensure a safer and resilient food system. Through a set of coordinated interventions, the project aims at identifying, validating and mainstreaming solutions to accelerate the sustainable and competitive transformation of the agricultural sector.

3. The project is implemented through four Components. *Component 1, Institutional Capacity Strengthening for Climate-Smart Agriculture Policy, Planning, and Investments* will advance and strengthen the agenda around soil and land conservation that the GoT has been promoting during the past decade. It will do so, by financing soil surveys, soil mapping and land classifications to cover the entire country, and also supporting the development of robust systems for data sharing, analysis and dissemination. It will support capacity building and piloting activities on the effective use of information generation to drive decision-making by different stakeholders, with a focus on policy decision makers. The component will also support the application of innovative technologies to enhance agriculture data collection and analysis. Under *Component 2. Enhancing Animal Health Capacity for Effective Disease Surveillance, Diagnostics and Control,* the focus is on enhancing the laboratory and staff capacity around surveillance and diagnostics of animal diseases of an economic and animal health and human heath relevance, including for ensuring the safety and effectiveness of veterinary medicines. *Component 3: Investments for Enhanced Productivity, Resource-Efficiency, and Climate Resilience* focuses on technology validation, dissemination, and adoption, particularly around CSA, through building partnerships and alliances with service providers for the emerging technologies already in the market and supporting research and dissemination efforts around technologies already developed or to be developed by TAGEM. *Component 4* supports *Project Management, Monitoring and Evaluation*. Table A2.1 below details the project costs by component and subcomponent.

Table A2.1: Summary of Project Costs (US$ 000' Dollars)

	World Bank		Beneficiaries	
	Amount	%	Amount	%
A. C1: Institutional Capacity Strengthening for Smart Agri-food policy, Planning and Investments				
1. SC1.1: Narrowing Information Gaps to Enhance Soil Health and Land-use Planning/Management	143,589	100.0	-	-
2. SC1.2: MoAF Digital Blueprint for Sectoral Information Collection and Management	8,000	100.0	-	-
Subtotal	151,589	100.0	-	-
B. C2: Enhancing Animal Health Capacity for Effective Disease Surveillance, Diagnostics and Control				
1. SC2.1: Strengthening the Capacity of Animal Health Institutes	31,271	100.0	-	-
2. SC2.2: Strengthening and Improving Veterinary Medical Product Control	50,008	100.0	-	-
Subtotal	81,279	100.0	-	-
C. C3: Investments for Enhanced Productivity, Resource Efficiency, and Climate Resilience.				
1. SC3.1: Strengthening Climate Resilience, Productivity, and Resource-use Efficiency in Horticultural Production	30,000	100.0	-	-
2. SC3.2: Promoting the Adoption of CSA Technologies/Practices	40,000	54.8	33,000	45.2
3. SC3.3: Reducing Animal Production Pressures on Water Pollution and GHG Emissions	15,000	100.0	-	-
4. SC3.4: Research and Innovations to Support CSA	14,750	100.0	-	-
Subtotal	99,750	75.1	33,000	24.9
D. C4: Project Management, Monitoring and Evaluation	8,652	100.0	-	-
	-	-	-	-
TOTAL PROJECT COSTS	341,270	91.2	33,000	8.8

Component 1: Institutional Capacity Strengthening for Climate-Smart Agriculture Policy, Planning, and Investments (US$151.5 million IBRD).

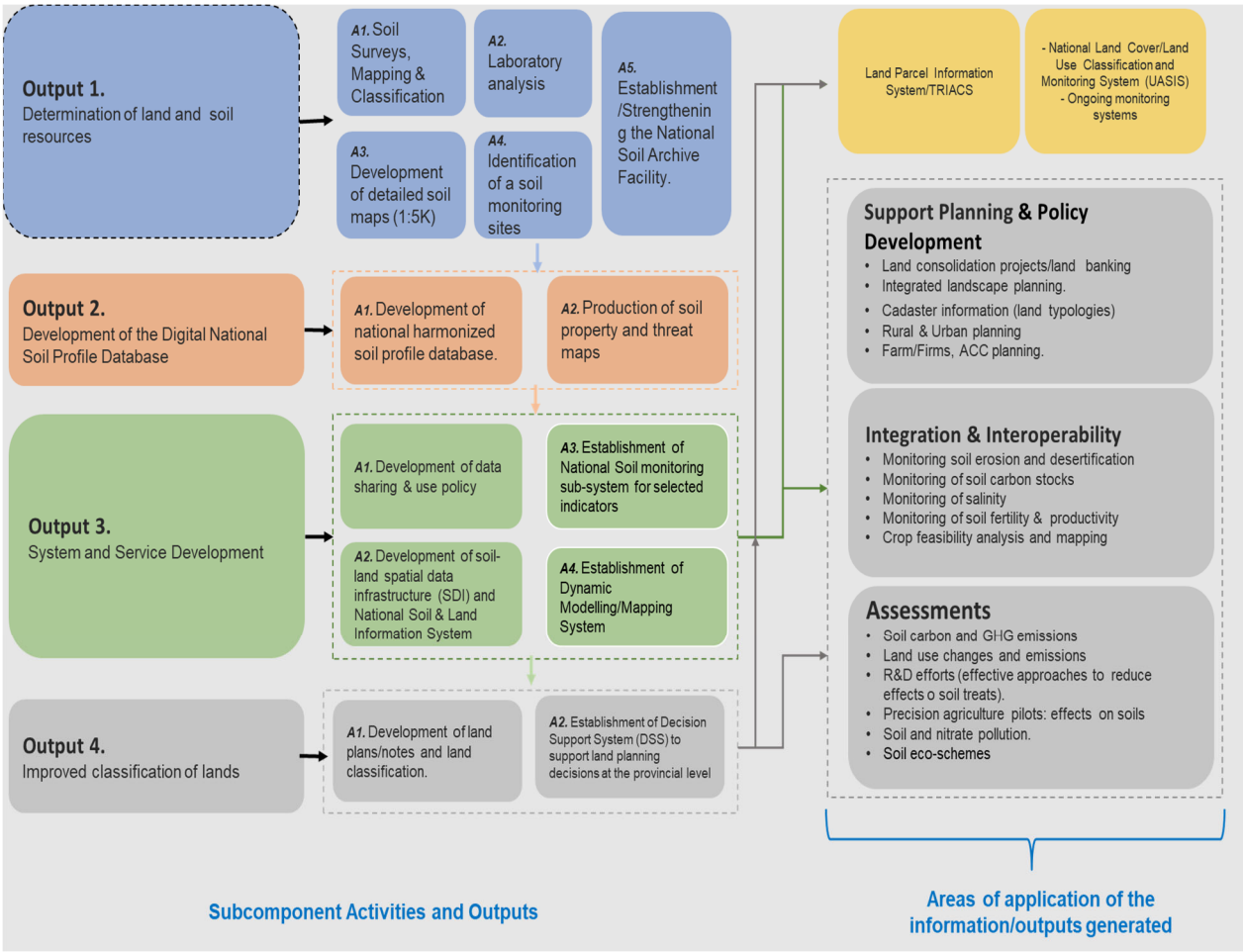
4. Activities will support the strengthening capacity for sectoral planning, with a specific focus on narrowing information gaps in relation to Turkey's soils and land natural capital, to contribute to their sustainable planning and management. Component activities will also enhance MoAF's digital blueprint for data collection and information management to support smart policy monitoring and programming.

5. **Subcomponent 1.1: Narrowing information gaps to enhance soil health and land-use planning/management** (US$143.5 million IBRD). The General Directorate of Agricultural Reform (TRGM) will lead the implementation of this component. TRGM through its Soil and Land Conservation Department is primarily responsible for the coordination and management of agricultural land resources and provides infrastructure services as an operational arm. The subcomponent activities are aligned to the GoT's Regulation No. 30265 aimed to protect and conserve land and soil resources dated 9 December 2017 and subsequently amended in 2018 and 2019, under Law No. 5403 on Soil Preservation and Land Utilization, which entered into force in 2005. Regulation No. 30265 sets procedures and principles for (i) improvement and classification of agricultural lands, (ii) determination of land and soil resources specified in Law No. 5403 on Soil Preservation and Land Utilization, (iii) land-use planning in compliance with the sustainable development principle, (iv) determination of erosion-sensitive areas, (v) implementation of soil

conservation and land management plans and projects, and (vi) establishment and duties of the Soil Preservation Board. Through this regulation, the government, under the leadership of the MoAF aims to find a balance between competition of different land uses while improving national agricultural production.

6. The subcomponent activities will support national and local capacity for soil and land-use planning and management, more specifically: (i) the determination of land and soil resources; (ii) the strengthening of the Digital National Profile Soil Database; (iii) the establishment of a system and service development for soils and land, and (iv) the classification of lands across the country, according to global and national standards. Figure A2.2, below, details the main activities and outputs of the subcomponent, which will be implemented in a sequential manner, as they are interrelated Training activities will be transversal, in support of the different outputs generated and to inform the applicability of the information generated. Details of the output blocks is presented below.

Figure A2.2: Subcomponent 1.1.: Main activities and outputs



7. *Determination of Soils and Land Resources/Assets:* the subcomponent will support MoAF's ongoing mapping efforts by extending the area of detailed soil surveys and soil classifications maps (1:5000 scale) to an additional 14 million hectares (to date MoAF has already conducted soil surveys in 8 million ha). This output will provide essential data and information to the other outputs in this subcomponent. It will be achieved through the implementation of

five main activities which will systematically examine, describe, classify, and map soils in 14 million ha area. Aerial photographs, satellite images, topographic and geology maps, legacy soil maps and digital elevation models (DEM) will be used to determine the soil profile locations, as well as the relationships between patterns of soil and patterns of images on photographs and images. These relationships will be used to predict the location of soil boundaries and the type of soils associated with them. The detailed soil maps will be produced using soil profile and site descriptions, auger controls, and laboratory analysis. The subcomponent will subsequently establish the national soil archive in alignment with international standards. The archive's core activities will be to store, archive and maintain soil specimens and their associated field records. The National Soil Archive facility will be constructed in an existing MoAF campus/premise. Activities will also support the identification of soil monitoring sites as an input to a dynamic system for periodic monitoring of soil threats (soil erosion, organic soil, desertification, salinity, etc.) to be established under output 3.

8. *Digital National Profile Soil Database*: the products from output 1 will provide then the basis to strengthen MoAF's efforts in establishing a Digital Harmonized National Profile Soil Database (output 2). This database will host soil/land profile information and thematic soil maps of prominent soil threats in Turkey. Specific investments to be supported include professional services for field activities, soil analysis and map preparation alongside investments in equipment (including software and IT), small works and specific professional consultancies.

9. *System and Service Development Activities*: activities under block output aim to support the government in using evidence and data driven for policy decision-making. This output will discern the data generated and storage in the soil database into information to support actionable results. Support will be provided to develop and/or optimize the soil and land information and decision support system in the TAD Portal.[71] Specifically, support will be provided to develop/optimize the Soil-land Spatial Data Infrastructure and National Soil & Land Information System. The following subsystems will be developed/optimized under the National Soil and Land information system: (i) National Soil monitoring sub-system for selected soil indicators; (ii) Dynamic Modelling/Mapping subsystem including the identification of soil monitoring sites for periodic monitoring of soil threats, nationally; and (iii) a geospatial Soil Organic Carbon Information sub-system. Support will also be provided for the development of data sharing and use policies aligned with international good practice experience. The systems and services to be supported will contribute to develop and guide sectoral climate change mitigation and adaptation strategies. Investments associated with this output include consultancy technical services, IT equipment and software

10. *Land Use Classifications:* subcomponent-related activities include the preparation of land utilization notes defining land cover classifications, which contribute to the delimitation of Turkish agricultural frontier (agricultural land versus other uses). Land note classifications will be carried out in 78.3 million hectares. The subcomponent will support pilot applications for the information generated, e.g., to determine crop suitability maps at the provincial/regional level. The decision support system will assist provincial authorities to provide extension and advice based on the soil classification which will improve soil and nutrient management and prevent soil degradation and enable rehabilitation of degraded lands. When land is degraded it reduces the ability of soil to absorb carbon which exacerbates climate change, hence the decision support system will play an important role in climate mitigation. This decision support tool will be developed with input from targeted beneficiaries. Investments associated with this output block include consultancy technical services, IT equipment and software.

11. Capacity building activities will be central to the implementation of the component, particularly around two

[71] The focus of the improvements will be on systems linked to the TAP Portal; however, support can also be extended to other relevant soil/land subsystems within MoAF.

areas: (i) technical aspects to ensure that best international experiences standards are followed for the establishment of the essential systems and services under output 3 (National Soil Information, Dynamic Mapping and Modeling, National Soil Monitoring Systems), the National Soil Archives, analytical procedures, land classifications, and other relevant technical activities supported by this subcomponent. For this, MoAF will consider during implementation the involvement of an external entity, potentially FAO, as the agency has already been supporting government efforts around soil analysis; and (ii) capacity for users of the soil and land information, therefore a set awareness campaigns, and dissemination and training efforts will be undertaken, targeting particularly local provincial governments and provincial soil conservation boards, with specific tools developed by the project to support such dissemination/training efforts. To facilitate data use, subcomponent activities will support upgrading, developing and/or validating user-friendly applications (e.g. via mobile phone) on soil and land information generated by the project. Farmers will be pro-actively engaged to develop and validate these applications in a participatory manner.

12. The soil and land data/information generated in this subcomponent will be used by different departments of MoAF and other agencies to inform strategies to improve the productivity and sustainability of Turkey's agricultural sector and increase the resilience and mitigation potential of the sector. The data generated will also be used to inform strategies around reducing land degradation and reducing the agri-food sector's carbon footprint, while supporting agricultural development and the conservation of biodiversity and will align Turkey with priorities defined by key trade partners such as the EU through its recently launched Soil Strategy 2030. In addition, the information system will also guide cross-sectoral work on land valuation, guide future land consolidation policies and investments led by MoAF, and provide data for other planning processes, such as climate and topographical maps, and data on potential water availability.

13. Activities under this subcomponent, particularly the systems, services and data products, are foundational to national climate change adaptation and mitigation efforts, as stated in in the National Climate Change Action Plan (2011-2023), the National Climate Change Adaptation Strategy and Action Plan and the Eleventh National Development plan (2019-2023), of all them highlight the protection and management of agricultural soils and lands, as a priority objective, with the priority activities identified in these plans, strongly aligned with the activities proposed under this subcomponent.

14. **Operational approach.** The approach for the implementation for the subcomponent is to initiate activities in the regions where areas are under intense pressure for conversion from fertile agriculture land to other land uses. A Data Science Unit will be established within MoAF and trained to perform tasks required for operating and maintaining the dynamic mapping and modeling and the national soil monitoring system. The Data Science Unit will remain operational after project closing. The staff in this unit will have regular training to sustain and increase new and relevant skills in data science (e.g. modelling, mapping, harmonization), including development of national datasets, maps, national soil profile database, monitoring and reporting trends in selected soil indicators, the spatial data infrastructure developed by the project will be maintained and managed by the relevant IT services. MoAF will liaise with IT services to ensure the data availability, uptime and continuity of the established systems and services. Pilot applications to facilitate the use of the information generated will be initiated in project year two or three, once the information on soil surveys and soil land classifications and maps have been completed for a set of provinces.

15. **Subcomponent 1.2: MoAF digital blueprint for sectoral information collection and management** (US$8 million IBRD). This implementation of this subcomponent lies under the responsibility of BTGM, in collaboration with TRGM and other GDs as relevant. Activities under this subcomponent will enhance MoAF's capacity for data collection and sectoral information management to support smart climate sectoral policy and planning. The subcomponent will

support the development, testing and implementation of improved data collection methods and modelling approaches for monitoring crop production and yields, provide production forecasts and overall contribute to agriculture planning (also considering climate change aspects) for food price monitoring, food security assessments, and other applications. The crop and yield forecasting systems will monitor crop vegetation growth, including the short-term effects of climate events on crop production. Both current and forecasted climate conditions are to be analyzed, focusing on short-term and medium-term time horizon, in order to evaluate different effects on climate change in crop and yield patterns and identify adaptation measures to mitigate the impacts identified. The subcomponent will support stakeholder consultations; analysis of data collection and modeling approaches implemented by other countries for crop/yield and production forecasting (including application of disrupting technologies); the design and piloting of modelling approaches for Turkey; and the implementation of a roadmap for the institutionalization of those modelling approaches. For the implementation of the subcomponent, MoAF will establish a Technical Committee with participation of the Scientific and Technological Research Council of Turkey TUBITAK, relevant scientific institutions, SBO and relevant MoAF GDs. MoAF has already initiated a partnership with TUBITAK for the assessment of existing systems and development of the road map developing and implementing modelling approaches. The findings of this assessment will inform project activities. The subcomponent will also support upgrades and integration of current institutional information systems to enhance monitoring of agriculture support programs. The subcomponent will finance mainly specialized consulting services, investments in equipment and computer infrastructure, and training.

Component 2: Enhancing animal health capacity for effective disease surveillance, diagnostics and control (US$81.2 million IBRD).

16. Climate change increases livestock susceptibility to diseases and also influences the emergence and proliferation of disease hosts and vectors (for details of how climate change affects resurgence animal diseases, see paragraph 19 of the main PAD section). Therefore, the need to have in place effective animal disease surveillance and diagnostic capabilities, as well as proper official regulatory policies and controls to ensure that effective veterinary medicines and vaccines for prevention or control of emerging and re-emerging animal diseases and zoonoses are produced to high standards and reach the market. It will also identify challenges and gaps in the existing surveillance and disease control program, strategic objectives, and program targets. This component will support MoAF's General Directorate of Food and Control (GKGM) on strengthening these important public functions. The component will support two main activities: strengthening the Veterinary Control Institutes and support the establishment of the National Veterinary Medicinal Control Center. The component will follow best practices (i.e. World Organization for Animal Health - OIE, European Union - EU) to support feasibility assessments, laboratory facilities and operative works, laboratory equipment, technical training for staff (as per the National Reference Laboratory defined plan for all laboratories), and information systems. Designs to maximize the green and resilient (e.g. seismic resistance, energy efficiency) elements in infrastructure and equipment will be considered, including the assessment of the feasibility for Class B or specifications linked to international certification. MoAF will consult with a Building Specialist to advise on specific building designs, prepare TORs for building designs, review designs, etc.

17. **Subcomponent 2.1: Strengthening the capacity of animal health institutes** (US$31.27million IBRD). The subcomponent will strengthen capacity of the GKGM to deal with introduction and spread of animal diseases and zoonoses due to climate and non-climate related factors via improvements in capacity for animal disease surveillance and diagnostics for infectious and vector-borne diseases, in accordance with standards set by international organizations (OIE, World Health Organization - WHO, Food and Agriculture Organization - FAO). Additionally, the investments aim to increase the accessibility to diagnostic services at the international scale, especially in the Eastern and South-eastern neighboring countries to Turkey. Subcomponent investments will enable Turkey to achieve a high

level of protection of animal health, human health, and the environment. It will further support Turkey's position as a trading partner through enhanced veterinary official certification while facilitating effective functioning of the national and international (EU and other trading partners) markets, as a part of sustainable socio-economic development.

18. In Turkey, there are eight officially nominated VCIs which are strategically located to cover assigned provinces, and as a laboratory network, to provide an all-Turkey coverage in testing capacity and capability for animal diseases and zoonoses using approved laboratory methods and tests. These include the Ankara/Etlik Veterinary Control Central Research Institute Directorate and the Veterinary Control Institutes in Pendik/Istanbul, Bornova/Izmir, Konya, Adana, Erzurum, Elazig and Samsun. All Institutes are certified by TURKAK to ISO Standard 17025 to ensure provision of accurate and reliable test results and hold accreditation of individual assays. They are required to participate regularly in specified inter-laboratory proficiency testing for quality assurance and accreditation purposes. Turkey currently uses international laboratories (i.e. UK, France) for this purpose, and the subcomponent investment will support a designated laboratory in Turkey towards the ISO 17043 accreditation to be able to perform the inter-laboratory proficiency testing function in Turkey.

19. Subcomponent activities will support construction works and improving laboratory bio-security levels (i.e. BSL 1 to BSL 2 or BSL 2 to BSL 3) in seven of the eight officially nominated VCIs. Most of these laboratories at these Institutes are located in old buildings that require construction work to ensure compliance with the required biosafety level standards (Table A2.2 below). It will include acquisition of modern equipment as appropriate for BSL 2 laboratory (e.g. autoclave, real time PCR machine, Biosafety cabinet Class II) and BSL 3 laboratory (e.g. Biosafety cabinet Class IIa and Class III, deep-freezers -80C and -30C, incubators, microscopes, ultra-centrifuges, real time and conventional PCR and ELISA machines). Subcomponent 2.1 will also support relevant training activities for laboratory personnel and veterinary officials, based on an Annual Plan developed by a designated National Reference Laboratory, and certification processes. This Plan would set the platform for implementation of structured training planning and approaches in defining training needs and implementing mechanisms such as officials and stakeholders training, pilot testing and simulation exercises, and practical use of relevant manuals together with guidelines which would also include aspects related to availability and application of relevant climate smart interventions.

20. Underpinning positive impacts of Subcomponent 2.1 are:

- By increasing the diagnostic and analysis capacity especially in border provinces, specifically in provinces where Erzurum, Adana, Konya, Samsun and Elazig VCIs have geographical coverage, losses in animal production will be reduced, significant contributions will be made in economic advances and food security, and on reducing the burden of animal and public health diseases at the national and regional level.
- The Etlik, Bornova and Pendik VCIs will focus and further contribute to the international laboratory services and research projects.
- Erzurum, Adana, Konya, Samsun and Elazig VCIs will gain cooperation capacity with countries in the region such as Georgia, Azerbaijan, Iraq and Iran, and potentially other countries may be included in the future.

21. Subcomponent investments will enable the VCIs to continue to play a key role in implementing strategic and risk-based epidemiological studies to support design and implementation of risk-based national surveillance and disease control programs for priority diseases and zoonoses. It will also enable for application of modern technology innovations to strengthen laboratory data management systems through linkages and management of large amounts of heterogenous data to ensure relevance, efficiency, effectiveness, impact, and sustainability. It will also enable that designated animal health laboratories are working together through improving functional synergies and practical

exchange and utilization of available capacity and capability to support national policy and decision making and risk-based implementation and corresponding official inspections. It will also ensure arrangements to increase capacity and capability in the event of an emergency, whether related to animal health or natural disasters or climate-related events.

Table A2.2: Veterinary Control Institutes (VCIs): Laboratory bio-safety level needs

Veterinary Control Institute	Location	BSL 3 Level needs		BSL 2 Level needs			
		BSL-3 (Virology & Bacteriology) – NEW Construction (Building)	**BSL-3 (Virology & Bacteriology** – Renovation (existing building)	**BSL-2 (Bacteriology)** - NEW Construction (new building)	**BSL-2 (Bacteriology)** - Renovation (existing building)	**BSL-2 (Virology)** - NEW Construction (Building)	**BSL-2 (Virology)** - Renovation (existing building)
Erzurum	Off Campus (land belongs to the Ministry)	1*	-	1*	-	1*	-
Adana	On Campus	1	-	1	-	-	-
Elazig	On Campus	1	-	1	-	1	-
Konya	On Campus	1	-	1	-	-	-
Samsun	On Campus	1	-	1	-	1	-
Bornova/ İzmir	On Campus	-	1	1	-	1	-
Pendik/ Istanbul	On Campus	1	-	-	1	-	1

*One of these laboratories will have necropsy and sample preparation units.

22. **Subcomponent 2.2: Strengthening and improving veterinary medicinal product controls for animal infectious and vector-borne diseases and zoonoses** (US$50.0 million IBRD). This subcomponent will support activities to improve the capacity of Turkey to control and regulate veterinary medicines and vaccines to ensure that effective and high-quality products reach the market. It will do so, by supporting the establishment of a centralized Veterinary Medicine Control Center, bringing together the functions that are now disaggregated in two different veterinary institutes. Currently, the GKGM relies on two institutes to implement veterinary medicine product oversight: Bornova Institute for vaccines controls and Pendik Institute for drug safety. However, these institutes do not have the animal BSL 3 infrastructure and enough dedicated personnel and equipment to perform the necessary control of veterinary medicine/vaccines, undertake target animal studies required for biosafety, and lack appropriate capacity to perform medicinal surveillance. The project will invest in construction works, equipment, and technical services to build: (i) test, analyses, and administrative facilities; (ii) a national vaccine strain collection (BSL2/BSL3 units); and (iii) experimental

laboratory units (BSL2/BSL3). Activities will also support capacity building and training (also covering climate-related topics as appropriate), certifications and some operational costs. The new center is expected to be self-sustaining through the provision of fee for services (official release tests, licensing, good manufacturing practices inspections, method development, training, and expert services, etc.) to the veterinary medical product sector i.e., manufactures, importers, exporters etc. MoAF through GKGM will retain its coordination and regulatory role while the institute will perform day to day operations and due diligence.

23. The center will increase confidence and transparency related to official regulatory checks, fulfilling licensing requirements and processes, quality control and training which will generate a source of income for the center. It will become the national leading institution in representing MoAF at international regulatory and standard setting fora (e.g. European Medicine Agency, European Pharmacopoeia). A detailed needs analysis, feasibility assessment and business planning will be undertaken during the first year of project implementation, analyzing issues of location, technical design, costs and sustainability, environmental and social risks and mitigation options; visits by MoAF staff to international reference centers, will also inform the assessment. Based on the findings of the assessment phase, it would be expected that the construction of the center could be initiated in the second or third year of project implementation. The investments in the Veterinary Medicine/Vaccine Control Center will eliminate the existing conflict of interest as MoAF's veterinary diagnostic laboratories that manufacture vaccines also perform official tests and analyses of private manufacturers/ importers. This will also provide for in-country facility for the veterinary medicine/vaccine efficacy and safety tests which are currently carried out abroad and costly.

Component 3: Investments for Enhanced Productivity, Resource-Efficiency, and Climate Resilience (US$99.75 million IBRD, US$ 33 million Beneficiaries).

24. This component will support investments aimed at enhancing production performance by improving productivity, reducing costs, promoting more efficient resource use (fertilizers, pesticides, energy, water), and improving climate resilience. Investments under this component are also expected to generate key agricultural data to support decision making by farmers and enterprises and to inform policy design. The project also proposes to encourage the uptake and effective use of innovative/disruptive climate-smart technologies by closing knowledge and skill gaps and by providing matching grants and technical assistance (TA) to producers and enterprises. The investments supported through grants and TA and knowledge sharing are expected to contribute to livelihood opportunities (creating jobs and generating income) and to reduce the overall environmental footprint of the agri-food sector, particularly as related to growing pollution from ineffective input/resource use and GHG emissions. Activities supported under Component 2 will be implemented through four subcomponents.

25. **Subcomponent 3.1: Strengthening climate resilience, productivity, and resource-use efficiency in Horticultural production** (US$30 million IBRD). Price and supply fluctuations are a recurrent problem in Turkey's horticulture due to several factors, with climate-related factors playing an increasingly important role. Protected agriculture, through the establishment of greenhouse production has been a priority in Turkey in the past decade, particularly for highly climate sensitive crops such as vegetables. This subcomponent will support ongoing public and private sector efforts to enhance protected agriculture in Turkey, via piloting of innovative clustering greenhouse approaches around direct uses of geothermal energy, to enhance the efficiency of protected agriculture and its role on climate resilience, while achieving efficiencies on energy /input use and improving soil health, generating important mitigation co-benefits. Greenhouse production can also support crop diversification for increased production of higher value and nutrient-rich vegetable products, contributing to improved nutrition outcomes.

26. When geothermal energy replaces fossil fuel in modern ("technology-based") greenhouses, it significantly reduces the costs, energy consumption, and potentially the carbon footprint of greenhouse production.[72] Private firms have established an estimated 440 ha of geothermally heated greenhouses in Turkey. Through the Greenhouse Development Project, prepared in 2019 by MoAF, the GoT set a target with stakeholders to expand the area of geothermally heated greenhouses to 2,500 ha by 2023. The three largest public-private investments to expand this infrastructure operate under the legal framework of the Specialized Industrial Zones Based on Agriculture (Tarıma Dayalı İhtisas Organize Sanayi Bölgesi—TDİOSB). Subcomponent 3.1 provides support to pilot a geothermal greenhouse business model based on a renewable energy resource to build basic infrastructure and mobilize private investors rapidly (for the construction of supra-infrastructure/greenhouses), while maintaining the advantages of a cluster. The model will be piloted in one or two TDİOSB sites, depending on costs assessments, selected from among the 14 sites where feasibility studies have already been undertaken by MoAF. Criteria for TDİOSB site selection will be further detailed during the first six months of project implementation, but would include technical/financial viability, opportunities to have higher social impacts, demonstrated interest and co-financing opportunities provided by local governments, private sector interest, among others. The selection of a proposed TDİOSB will be approved by the Bank. Subcomponent funds will cover consulting services for zone planning and geological surveys and basic enabling infrastructure (civil infrastructure and construction works such as: geothermal heating power production facility; energy transmission line and network backup power line as well as an electrical substation; potable and utility water reservoirs and pumping stations; telecommunication center; foundation drainage connection line; gas supply, local roads; etc.); studies and feasibility analysis of different investment models and investment needs; and dissemination and outreach activities to target partnerships with the private sector. All these investments will be identified during the feasibility study.

27. Implementation of this subcomponent will be led by the General Directorate of Agricultural Reform (TRGM) under the Department of Organized Agriculture and Livestock Zones, in close coordination with the selected TDİOSB (s) where the geothermal-based greenhouse infrastructure is to be located (specialized greenhouse TDİOSB-geothermal sourced). The selected TDİOSB (s) to be supported will prepare a Subproject Investment Plan for infrastructure-related investments to be implemented in phases, in close consultation with TRGM. The project will finance the total Subproject investment costs (as per ceilings to be determined in the PMO). Funds will be provided to the selected TDİOSB(s) on a loan basis, following guidance established in Law No. 4562 on Organized Industrial Zones and on relevant associated regulations and Presidential decrees.

28. Financing on a loan basis will be provided under reasonable terms and conditions acceptable, as specified in the POM, including those relating to the maturity, interest rate, markup, charges and/or fees. Currently MoAF's lending conditions to TDİOSBs include a 3% interest rate, maturity 13 years and 3-year grace period. Approval of specific Subproject investments will be subject to technical and financial viability, as well as compliance with environmental and social requirements, among other criteria, to be detailed in the POM. A plan for a phase-based approach to the implementation of the subcomponent activities will be prepared by TRGM during the first months of project implementation. TRGM will be responsible of monitoring the proper implementation of the TDİOSB Subproject Investment Plan, including compliance with E&S requirements.

29. **Subcomponent 3.2: Promoting the adoption of CSA technologies/practices** (US$40 million IBRD, US$33 million Beneficiaries). The subcomponent will expand the use of emerging innovative/disruptive CSA and energy-efficient technologies on small and medium farms to enhance the productivity and profitability of farm operations, increase

[72] Heating expenditures are 35–60% of production costs.

input-efficiencies and reduce carbon footprint and other negative environmental impacts. This subcomponent will primarily focus on awareness creation, dissemination and providing co-funding opportunities for digitally enabled technologies and solutions (smart and precision agriculture).

30. Transformation towards an agricultural system that is more productive, competitive, and resilient while reducing the negative impact on climate change is essential for sustainability. Digital technologies can play a pivotal role in this transformation by lowering the transaction cost of this shift and easing access to information.[73] Subcomponent investments will focus on supporting awareness and dissemination activities and investments in emerging digital CSA technologies already commercially available in Turkey, in partnership with the private sector and will share the costs of acquiring equipment/machinery and related goods, license fees for remote sensing and cloud-based analytical services, and training. The prioritization of digital CSA technologies will be demand-driven, including: (i) digital climate-smart decision support systems for agricultural value chains that integrate remote sensing technologies with cloud computing and Internet of Things devices (sensors, field stations, digital insect traps, drones, cameras, etc.); (ii) variable-rate technology to apply agricultural inputs; and (iii) digitally assisted steering systems for tractors to optimize field operations. Activities will aim at expanding the use of readily available commercial technologies in partnership with the private sector and will cover acquisition of equipment/machinery and related goods, license fees for remote sensing and cloud-based analytical services, sensors and climate field stations, installation support, after-sales services and training. The focus will be on technologies that are suitable for small and medium farm enterprises, or that will enhance supply chain coordination and provision of services to farmers by producer organizations, agribusiness, etc. Increased access to climate-smart-digital technologies will optimize the use of fertilizer, pesticides, water, and energy and increase farm profitability, while reducing pollution and GHG emissions supporting climate change adaptation and mitigation. Special attention will be paid to using gender-appropriate communication channels to reach women to address constraints on accessing agriculture advisory services and support.

31. The subcomponent implementation approach will be to demonstrate and innovate, with careful attention paid to assure replicability. A matching grant (co-sharing) mechanism will be established targeting producer organizations/cooperatives; agribusinesses working with contract farmers; and private service providers targeting small and medium farm enterprises. The grant windows for producer organizations, agribusinesses and pother service providers will facilitate access to technologies and related services by smaller farmers who may be unable to purchase and use them effectively on an individual basis. Matching grant support is demand driven. Depending on the technology, focus will be on field and industrial crops as well as on orchards and other tree crops (e.g., grapes, olives). Grants would fund approximately 50% of eligible investment costs.[74] The final matching grant ceilings and cost-sharing requirements, as well as detailed implementation arrangements will be specified in the Grants Manual.

32. Given that most smart technologies are still new to most farmers and also to many local level extension workers, the roll out of the subcomponent will start with the implementation of activities to create awareness and enhance knowledge about available technological solutions and how they can help addressing key productivity and sustainability issues in agriculture. Technology fairs, field days and workshops will be organized at provincial level where farmers, cooperatives, associations, agribusiness companies as well as local agronomists and other field staff can get direct

[73] Precision farming and regenerative or conservation agriculture are key entry points for the promotion of CSA highlighted by the World Bank Climate Change Strategy 2021-2025 (Transition sector: Agriculture, Food, Water and Land).
[74] Presidential Decree No. 2800, July 27, 2020, provides MoAF with the national legal basis for carrying out the matching grant program under Subcomponent 3.2 of the project, as well as for the types of activities covered by Subcomponent 3.2, and the financing framework for the matching grants.

exposure to different technologies and meet technology providers as well as users of technologies. The project will generate basic introductory and training material in the form of audiovisual presentations, short videos, summary notes and e-learning material on the main types of smart technologies being supported and their use cases in terms problems that each technology can help to solve, benefits to be expected, costs, as well as technical and other requirements for their use. This information will be made available through a dedicated website (smart agriculture platform) that will be created and curated by the project, as well as through dissemination events. This platform will serve as a one-stop shop and also provide information on the activities and support provided by the project in the target provinces, including smart technology fairs and field demonstration, trainings (online and presential), accredited technology suppliers; and the modalities of matching grants support (scope of support, eligibility criteria, application forms, and implementation process). This platform will also facilitate engagement of and data sharing between farmers, service providers, other actors and the Ministry; user experiences, testimonies, as well as studies and evaluations of smart technologies will also be accessible through the platform.

33. The implementation of the subcomponent activities will be coordinated by the Agricultural Technologies and Mechanization Department of TRGM with technical contributions from other units at MoAF, as needed, and collaboration with TAGEM. At provincial level, management of the co-financing schemes and other activities will be coordinated by the Provincial Directorates of Agriculture, in collaboration with agricultural unions, chambers, farmer organizations, and research entities. TAGEM will support TRGM on the structured evaluations of the technologies to understand their impacts. During the first six months of project implementation, a quick assessment of the smart technology landscape will be conducted to map further the existing technologies and technology suppliers as well the current use of smart technologies in different regions of Turkey (including women users). This will help to identify Provinces that are likely to have the highest demand for such technologies in the short to medium term based on their cropping patterns, farm size structures, agro-ecologic conditions and other factors. The assessment will also (i) confirm the technologies that will be supported initially during the project through awareness creation, field demonstrations, grant support and training, and (ii) determine to what extent demonstration and training are required for different types of technologies in different regions and incorporating gender and youth considerations. Subcomponent activities will be piloted in a limited number of Provinces (5-7) during the first two years to test the model and implementation procedures, and better understand farmer demand. These targeted Provinces will reflect the diversity of agro-climatic conditions, cropping systems, farming structure etc. Subsequently, based on the lessons and experiences, the grant program will be expanded into more provinces. Starting the grant program in a limited number of provinces is important for operational purposes, in order to avoid fragmentation of resources available and be able to strengthen the enabling environment for technology adoption beyond grant support. The latter includes targeted field demonstrations, awareness creation and local stakeholder engagement, strengthening the knowledge of these stakeholders on smart technologies to be supported, and enable close monitoring and knowledge management.

34. **Subcomponent 3.3: Reducing animal production pressures on water pollution and GHG emissions** (US$15 million IBRD). Increasing concerns, globally and nationally, on the negative impacts of animal production (particularly livestock) on climate change and water pollution, represent a challenge but at the same time an opportunity to push forward an agenda around greening the livestock sector. Investments under Subcomponent 3.3 will complement ongoing efforts by MoAF to improve livestock productivity (for example, efforts around pasture reclamation and management, as well as, for the modernization of barns and on farm management of manure), with additional support focusing on innovative technology-based and collective approaches to support pollution management, enhance sustainability, and strengthen climate mitigation. It will do so by supporting the implementation and piloting of innovative approaches on manure management to reduce animal production pressures on water pollution and GHG emissions, as well as other sources of water pollution associated with the use of chemical fertilizers

in pastures and feed crops. Subcomponent activities are to be implemented by TRGM coordinated by the Department of Protection of Agricultural Environment and Natural Resources.

35. The subcomponent will focus activities on the Küçük Menderes sub-basin of the Küçük Menderes basin (in the Aegean region), and the Sarıgöl-Alaşehir-Salihli, Manisa-Saruhanlı and Turgutlu-Ahmetli sub-basins of the Gediz basin, defined as a Qualified Nitrated Vulnerable Zones by MoAF. Water pollution in these sub-basins results mainly from the presence of a significant amount of medium/large sized livestock farms (mainly cattle). The main source of contamination comes from improper manure management, which also generates important GHG emissions. Overall, the lack of efficient manure management contributes importantly to water pollution, but also to GHG emissions in Turkey, as of the total emissions from agriculture, 13% are from methane mainly from livestock (cattle). Livestock enterprises in the sub-basin and across Turkey, currently do not have proper manure collection/storage facilities in compliance with Good Agriculture Practice (GAP) code. This is due to the lack of suitable areas to build manure storage facilities on-farm and to other logistical (e.g. distance for manure collection), knowledge and financial challenges. The subcomponent activities will focus on piloting and promoting innovative approaches for manure management including: establishment of an information network of relevant stakeholders to share experience and knowledge around manure management; training of professionals to support preparation of manure management plans/monitoring; piloting incentives/approaches for sustainable manure management, including undertaken a pilot for encouraging third-party manure collection and processing, potentially linked to biogas generation; and training on policy analysis. The subcomponent will finance construction works and equipment, equipment for transportation and application of biofertilizer in fields, training and demonstrations and specialized consulting services.

36. **Subcomponent 3.4: Research and innovations to support CSA** (US$14.75 million IBRD). Activities under this subcomponent are to be implemented by TAGEM. While Subcomponent 3.2 will focus on validating and mainstreaming commercially available technologies, this subcomponent focuses on the development, validation and/or dissemination of in-house (by TAGEM) climate/green agricultural technologies. Activities under this subcomponent will support the implementation of a research and innovation agenda around CSA in alignment with priorities identified in the recently launched Green Deal Plan, including reducing the use of pesticides, enhancing nutrient management (through biofertilizers), and enhancing energy and water efficiencies and support climate -related assessments. The project will also sensitize TAGEM's RD&I to reflect women's needs and unique priorities when generating and adapting CSA technologies.

37. **Pest Management**. The subcomponent activities will focus on strengthening research and training on integrated pest management (IPM), especially biological and biotechnical control methods, in order to reduce the effects of pesticides on the environment and human health and to prevent economic losses. Focal products will mainly be citrus, wheat, potato, and corn. Research and dissemination activities will demonstrate the business case for the implementation of IPM systems, which contribute to climate mitigation and adaptation, which compromises a set of (i) preventive (good agricultural practices), (ii) monitoring, and (iii) control approaches. The activities will be implemented in close coordination with exporter associations active in the selected provinces/regions (e.g. the Mediterranean Fresh Fruits and Vegetables Exporters' Association (MEA)), and private operators (e.g. providers of e-pest control strategies). The implementation of activities will be coordinated by TAGEM working in close coordination with the Plant Protection Research Institutes in Ankara, Izmir and Adana.

38. **Fertilizers.** Due to the inefficient and excessive use of intensive chemical fertilizers in agricultural production, soils and water are polluted, soil productivity has declined and GHG emission (N2O) have increased, contributing to climate change. The activities under this area would focus on strengthening the business case for the expanded use of

microbial fertilizers, particularly in legume crops and support the achievement of efficiencies in fertilizer applications. TAGEM's Soil Fertilizer and Water Resources Central Research Institute will lead research activities under this pillar, productivity, economic, social and environmental impacts of the improved use of microbiological/biological fertilizers in the production of legumes; crops experiencing a significant productivity decline in the last years. Research activities will be carried out, for at least two-three seasons in selected provinces of Ankara, Antalya, Eskişehir, İzmir, Şanlıurfa and Tokat (Central Anatolia), Aegean, Black Sea, Mediterranean and GAP Regions. The focal crops will be green lentils, chickpeas, dried beans, red lentils, vetch and peas, through participatory research led by TAGEM's research centers on those regions. Demonstration plots, dissemination and training events will be supported. The subcomponent will also support the expansion of production capacity of TAGEM Soil Fertilizer and Water Resources Central Research Institute from the production of bio-fertilizers, which is currently estimated at 20 ton/year.

39. **Climate/soils.** The subcomponent will support the implementation of research and dissemination activities around soil carbon sequestration, as a way to inform a strategy on carbon sequestration and identify mechanisms for reducing the carbon and water footprint of the sector. A survey-based assessment of climate resilience and farm and institutional responses will be carried out. The pillar will also support the establishment of living laboratories[75] and associated activities for the dissemination of energy-saving technologies developed by TAGEM (e.g. mobile hybrid milker prototype powdered with solar energy, aimed at improving quality and safety of milk, while reducing costs and GHG emissions). It will also support purchasing and installing of equipment and civil works for refurnishing existing facilities, to strengthen capacity of institutes to carry out research & innovations and provide services in key climate change topics.

Component 4: Project Management, Monitoring, and Evaluation (US$8.65 million IBRD).

40. Activities under this component will support all project management functions. It will include support for a Project Coordination Unit (PCU) and Project Implementation Units (PIUs) under TRGM, TAGEM, BTGM and GKGM, for (i) strengthening capacity for day-to-day project management of technical, fiduciary, Monitoring and Evaluation (M&E), E&S issues; (ii) E&S risk management, including preparation of site-specific E&S instruments required; (iii) grievance redress, citizen engagement, and communications; and (iv) M&E of project activities, including impact assessments, beneficiary satisfaction surveys, and development of an integrated system for project management and monitoring of project outputs and outcomes. The strategy for communication will be coordinated by the PCU and implemented together with the PIUs.

41. **Project geographic and subsector prioritization**. Project activities are expected to have broad sectoral and more specific sub-sectoral impacts. Activities under Components 1 and 2 are expected to build capacity broadly, con impacts expected across the agricultural sector rather than having a specific geographic focus. The geographic prioritization of activities under Component 3 reflects crop/livestock geographical patterns, levels of agriculture intensification and associated negative climate, pollution and other impacts, and climate vulnerability, among other factors, see Table A2.2, below. The complementarity of activities under Component 3, is presented in Table A2.3. While Subcomponents 3.1, 3.2 and 3.3 have a more specific sub sectoral/crop focus via supporting adoption of technologies commercially available, activities under TAGEM (Subcomponent 3.4) are focusing on in-house technologies and research. Some training activities proposed under Subcomponent 3.4 are to be transversal to technology-related activities under Subcomponent 3.1; Subcomponent 3.2 and Subcomponent 3.3.

[75] Living Labs (LLs) are interactive innovation ecosystems in which users co-create new solutions, integrating research and innovation processes in real life settings.

Table A2.2: Geographical prioritization of Subcomponent activities

Subcomponent (SC)	Geographic focus	Main geographical focalization criteria/focalization of impacts
SC1.1: Narrowing information gaps to enhance soil health and land-planning/management	Nationwide	Broad sectoral impacts
SC1.2: MoAF digital blueprint for sectoral information collection and management	Nationwide	Broad sectoral impacts
SC2.1: Strengthening the capacity of animal health institutes	Adana, Elazig, Erzurum, Konya, Samsun, Izmir and Istanbul.	Broad sectoral impacts
SC2.2: Strengthening and improving veterinary medicinal product controls for animal infectious and vector-borne diseases and zoonoses	Ankara (potentially, to be determined during in-depth feasibility assessment)	Broad sectoral impacts
SC3.1: Strengthening climate resilience, productivity, and resource-use efficiency in horticulture production	Potential provinces (selected among: Adana, Afyonkarahisar, Aydın, Balıkesir, Bitlis, Elazığ, İzmir, Kayseri, Kütahya, Malatya, Manisa, Nevşehir, Tokat and Zonguldak).	Vegetable production in areas with high presence of greenhouse production and potential for geothermal resources, high private and public sector interest.
SC3.2: Promoting the adoption CSA technologies/practices	Provinces in Thrace, Aegean, Central Anatolia, South and South East (large agricultural production areas)	Large agricultural production areas. Roll out of project investments will start in a limited number of provinces first and it will be gradually expanded to more provinces.
SC3.3: Reducing animal production pressures on water pollution and GHG emissions	Aegean Region, particularly in Küçük Menderes Basin, potentially in two of the following districts: Odemis, Tire, Kiraz and Torbali. - Gediz Basin, potentially in two of the following districts: Salihli, Saruhanlı, Ahmetli and Turgutlu. Other basins with similar problems could potentially be considered for project activities during implementation.	Production areas with high livestock intensity, creating significant water pollution problems (Nitrate Vulnerable Zones)
SC3.4: Research and innovations to support CSA in Turkey	A wide range of provinces depending on the focus of the /dissemination activities.	Focalization based on commodity focus (main production areas for specific crops/sheep production)

Table A2.3: Sub-sectoral focus and complementarity of project investments under Component 3

Horticulture/Vegetables	SC3.1. Pilot for clustered greenhouse production/geothermal
	SC3.2. CSA technologies
	SC3.4. Specific activities around reduction of pesticide use (focus export crops)
Dairy/livestock production	SC3.3. Activities around manure management.
	SC3.4. Specific activities (resource efficient technologies in milking for sheep/goat milk)
Fruit & Tree crops	SC 3.2. CSA technologies & SC3.4. Specific activities around reduction of pesticide use, particularly in key export crops (citrus, almonds, etc.)
Legume	SC3.4. Specific activities on expanding the use of biological fertilizers
Grains/oil-crops	SC 3.2. CSA technologies for efficient input use (efficient pesticide and fertilizer use, efficient energy use), reduce harvest losses, enhance productivity and achieve climate impacts.

ANNEX 3: Economic and Financial Analysis

COUNTRY: Turkey
Climate Smart and Competitive Agricultural Growth Project

A. Summary

1. Ex-ante cost-benefit analysis was conducted to determine project feasibility. The cost-benefit analysis included both, financial analysis carried out using actual market prices as well as economic analysis considering shadow prices (social prices) of agricultural outputs and inputs, exchange rate and CO2 eq. Other assumptions and parameters were considered to estimate the project's economic and financial indicators considering the characteristics of each activity finance by the project and based on different information sources. The results of the financial analysis show the returns to project-supported activities from the perspective of private sector, while the results of the economic analysis show the returns to Turkish society, which will be of interest particularly to the decision related with the public investment.

2. The results of the economic analysis show positive returns on the overall investment, components, subcomponents, activities and technologies considering the project's environmental benefits (reflected in the valuation of the GHG emissions reduction), 20-year evaluation period and a social discount rate of 6%. The Net Present Value (NPV), Internal Rate of Return (IRR), Benefit/Cost ratio (B/C) and the payback period were estimated at US$311.6 million, 7.23%, 1.28 and 12.38 years, respectively. Meanwhile, the estimated financial indicators show mixed results depending on the value of the cost of capital for the agricultural sector in Turkey. Considering a cost of capital of 6%, the NPV, IRR, B/C and payback period were estimated at US$121.1 million, 6.43%, 1.14 and 12.95 years, respectively. The scenario analysis shows that the project would have positive returns on investment in economic terms despite a moderately pessimistic scenario, in terms of interest rate increases and devaluation of the local currency in relation to the dollar. The sensitivity analysis shows that the economic returns of the overall project and its components would remain positive even if environmental benefits were not included in the cash flow. The returns would remain positive in case the incremental revenue to be reduced hypothetically at 10%. Changes in economic return values in response to variations of key variables reflect the analysis' robustness.

B. Identification of the project costs and benefits

3. The ex-ante cost-benefit analysis considered incremental costs and benefits attributable to the project, which were identified based on the activities proposed by the project as well as developments expected to occur in future years, as reflected in the theory of change. The benefit streams take into consideration by this analysis were the estimated incremental income realized by project beneficiaries as a result of the improved access to information for the decision-making process, technology adoption and new skills acquired by the beneficiaries from participating in training activities. The main expected incremental benefits and costs for each component, subcomponent, activity or technology packages financed by the project are summarized in Table 3.1. The greenhouse gas (GHG) reduction benefits for the economic analysis are quantified in the Annex 4.

4. The timing of cost and benefit flows were adjusted to reflect the duration of the activity implementation period and the expected distribution through time of the cost and benefits. Moreover, achievement or technology adoption rates were applied to reflect expectations of success for each intervention financed by the project. Several additional

benefit streams were not considered including: i) future productivity gains that may be realized by producers and other agricultural value chain actors and ii) other positive externalities such as soil erosion reduction for the improvement of the land and soil planning. These additional benefit streams could be significant. In this sense, the estimated values of the EFA indicators can be considered conservative.

Table 3.1: Summary of costs and benefits used in ex-ante feasibility analysis

Subprojects/ activities/technology	Expected benefits/costs
Component 1. Institutional capacity strengthening for climate-smart agriculture policy, planning and investments	
Subcomponent 1.1. Narrowing information gaps to enhance soil health and land-planning/management	**Benefits:** **i) With project scenario** The reduction in the agricultural land loss is considered. Based on the production of the main crops in Turkey, the benefits are estimated in the areas of agricultural land that are no longer lost as a result of the project's direct action. In addition, the benefits related to savings in soil analysis are considered for the estimates taking into account the costs of performing soil physical and chemical analysis. GHG emission reduction for preserving agricultural lands are accounted as a benefit **ii) without project scenario** Lost agricultural land on which the main crops of importance to the agricultural sector in Turkey are no longer produced. It is assumed that these lands are rented for other activities, which represents the opportunity cost of not using it for agricultural production. **Costs:** **i) With project scenario** The production costs of the main crops produced on agricultural land that are not lost as a result of the project are considered. Maintenance costs of the improved national soil and land information system are considered. **ii) Without project scenario** Fixed costs of maintaining agricultural land without crop production such as taxes, security and services are not included in the rent.
Subcomponent 1.2. MoAF digital blueprint for sectoral information collection and management	**Benefits:** **i) With project scenario** Cost reduction for accessing to specialized agricultural information for the decision-making process at the production systems level is taken into account to determine the benefits. This value is estimated based on the cost structure per hectare of the main agricultural products. **ii) Without project scenario** It is assumed that farmers do not have free access to specialized agricultural information for decision-making at the production systems level. **Costs:** **i) With project scenario** Maintenance of the integrated agricultural information system **ii) Without project scenario** Maintenance of the current agricultural information system
Component 2. Enhancing Animal Health Capacity for Effective Disease Surveillance and Diagnostics	
Subcomponent 2.1 Strengthening the Capacity of Veterinary Control Institutes	**Benefits:** **i) With project scenario** i) Reduced animal mortality rate as a result of the improvement of the disease surveillance, prevention and control system and, ii) reduced costs of using veterinary products as a result of the improvement of the surveillance and prevention system to avoid animal diseases **ii) Without project scenario** It is assumed that the disease surveillance, prevention and control of animal diseases has limited coverage which may cause outbreaks of animal diseases with high mortality rate **Costs:** **i) With project scenario** Maintenance and operating cost of the improved disease surveillance, prevention and control system **ii) Without project scenario** Maintenance and operating cost of the current disease surveillance, prevention and control system
Subcomponent 2.2 Strengthening and improving veterinary medicinal product controls for animal	**Benefits:** **i) With project scenario** Improved control of veterinary products, which allows the issuance of sanitary certificates to increase exports of animal products. **ii) Without project scenario** It is assumed that the coverage of the veterinary control system is limited, and it does not allow accelerating the issuance of sanitary

infectious and vector-borne diseases and zoonoses	certificate to increase the export of animal products **Costs:** **i) With project scenario** Maintenance and operating cost of the improved veterinary control system **ii) Without project scenario** Maintenance and operating cost of the current veterinary control system
Component 3. Investments for enhanced productivity, resource-efficiency, and climate resilience	
Subcomponent 3.1 Strengthening climate resilience, productivity, and resource-use efficiency in horticultural production	
Pilot model for greenhouse-clustering production linked to efficient energy use	**Benefits:** **i) With project scenario** - Increase in yields: tomato and cucumber - Reduction in energy cost **ii) Without project scenario** - Income of traditional production system in small-scale greenhouses heated by charcoal, fuel or electricity: tomato and cucumber **Costs:** ***i) With project scenario*** - Incremental production cost: tomato and cucumber - Incremental maintenance cost of the infrastructure ***ii) Without project scenario*** - Production cost: tomato and cucumber - Maintenance cost of the traditional infrastructure
Subcomponent 3.2 Promoting the adoption of climate-smart agricultural technologies/practices- Digital CSA technologies	
i) Smart Farm Management and Decision Support System	**Benefits:** **i) With project scenario** - Increase in yields: peaches, apricots - Reduction in fertilizer/pesticides/water costs **ii) Without project scenario** - Income of traditional production system: peaches and apricots **Costs:** ***i) With project scenario*** - Incremental production cost: peaches and apricots - Fees to access to the making decision support system ***ii) Without project scenario*** - Production cost: peaches and apricots
ii) Digitally assisted steering systems - Manuel Aided Steering Systems Treamline System (MASSTS)	**Benefits:** ***i) With project scenario*** - Increase in yields: barley, sugar beet, sunflower seed, wheat and Rye - Reduction in fertilizer/pesticides/water/fuel costs ***ii) Without project scenario*** - Income of traditional production system: barley, sugar beet, sunflower seed, wheat and Rye **Costs:** ***i) With project scenario*** - Incremental production cost: barley, sugar beet, sunflower seed, wheat and Rye - Fees and maintenance costs to access to the MASSTL system ***ii) Without project scenario*** - Production cost: barley, sugar beet, sunflower seed, wheat and Rye
iii) Digitally assisted steering systems - Manuel Aided Steering Control Systems (MASSCS)	**Benefits:** ***i) With project scenario*** - Increase in yields: barley, wheat, rye, cotton and corn - Reduction in fertilizer/pesticides/water/fuel costs ***ii) Without project scenario*** - Income of traditional production system: barley, wheat, rye, cotton and corn **Costs:** ***i) With project scenario*** - Incremental production cost: barley, wheat, rye, cotton and corn - Fees and maintenance costs to access to the MASSSC system ***ii) Without project scenario*** - Production cost: barley, barley, wheat, rye, cotton and corn

iv) Digitally assisted steering systems - Automated steering systems (ASS)	**Benefits:** ***i) With project scenario*** - Increase in yields: barley, wheat, sunflower, cotton and corn - Reduction in fertilizer/pesticides/water/fuel costs ***ii) Without project scenario*** - Income of traditional production system: barley, wheat, sunflower, cotton and corn **Costs:** ***i) With project scenario*** - Incremental production cost: barley, wheat, sunflower, cotton and corn - Fees and maintenance costs to access to the ASS system ***ii) Without project scenario*** - Production cost: barley, wheat, sunflower, cotton and corn
v) Variable rate technologies (VRTs)	**Benefits:** ***i) With project scenario*** - Increase in yields: barley, sunflower, wheat and corn - Reduction in fertilizer/pesticides/water/fuel costs ***ii) Without project scenario*** - Income of traditional production system: barley, sunflower, wheat and corn **Costs:** ***i) With project scenario*** - Incremental production cost: barley, sunflower, wheat and corn - Fees and maintenance costs to access to the VRTs system ***ii) Without project scenario*** - Production cost: barley, wheat, sunflower, cotton and corn
Subcomponent 3.3 Reducing animal production pressures on water pollution and GHG emissions	
i) Reducing cattle production pressures on water pollution and GHG emissions	**Benefits:** ***i) With project scenario*** - Increase in treated manure use for the crop production as source of Nitrogen, Phosphorus and potassium ***ii) Without project scenario*** - Treated manure use for the crop production **Costs:** ***i) With project scenario*** - Incremental production cost to treat manure - Maintenance costs of the manure storage and treatment system ***ii) Without project scenario*** - Treatment manure cost
Subcomponent 3.4 Research and Innovations to Support Climate-Smart Agriculture in Turkey	
i) Pesticides management	**Benefits:** ***i) With project scenario*** - Increase in yields (GAP): citrus, wheat, potato, corn - Reduction in pesticide cost (technology) - Increase in prices (organic products): ***ii) Without project scenario*** - Income of traditional production system: citrus, wheat, potato, corn **Costs:** ***i) With project scenario*** - Incremental production costs: citrus, wheat, potato, corn ***ii) Without project scenario:*** apricots, oranges and cotton - Traditional production costs
ii) Fertilizer management	**Benefits:** ***i) With project scenario*** - Increase in yields (GAP): Beans, chickpeas, lentils and vetches - Reduction in fertilizer costs (technology): phosphorus ***ii) Without project scenario*** - Income of traditional production system: Beans, chickpeas, lentils and vetches **Costs:** ***i) With project scenario*** - Incremental production costs: Beans, chickpeas, lentils and vetches ***ii) Without project scenario*** - Traditional production costs: Beans, chickpeas, lentils and vetches
iii) Improvement of soil health	**Benefits:** **i) With project scenario** - Increase in yields (GAP): barley, wheat, rye, cotton and corn

	- Reduction in fertilizer costs (technology): nitrogen **ii) Without project scenario** - Income of traditional production system: barley, wheat, rye, cotton and corn **Costs:** **i) With project scenario** - Incremental production costs: barley, wheat, rye, cotton and corn **ii) Without project scenario** - Traditional production costs: barley, wheat, rye, cotton and corn
iv) Climate change technologies - Water	**Benefits:** **i) With project scenario** - Increase in yields (GAP): Apples, oranges, cucumber - Reduction in water/fertilizer/energy costs (technology) **ii) Without project scenario** - Income of traditional production system: Apples, oranges, cucumber **Costs:** **i) With project scenario** - Incremental production costs: apples, oranges, cucumber **ii) Without project scenario** - Traditional production costs: apples, oranges, cucumber
v) Climate change technologies – dairy sector	**Benefits:** **i) With project scenario** - Increase in milk production (training): cattle - Reduction in energy/fuel costs (technology) **ii) Without project scenario** - Income of traditional production system: milk (cattle) **Costs:** **i) With project scenario** - Incremental production costs (milk): cattle - Maintenance costs of the new technologies **ii) Without project scenario** - Traditional production costs (milk): cattle
Component 4. Project Management, Monitoring and Evaluation	
Incremental benefits were not identified for this component, since it is assumed that the activities implemented under this component are aimed at creating the enabling conditions, which will generate the direct and indirect benefits as part of the Components 1 and 2. Costs associated with the implementation of this component were included in the overall cost-benefit analysis as part of total project costs.	

C. Data sources

5. The ex-ante cost-benefit analysis relied on information from different sources: i) statistical data collected from various information systems, ii) Information provided directly by the governmental institutions involved in the project preparation, iii) studies, reports and specialized articles and iv) specific assumptions according to the characteristics of each activity that will be implemented by the project.

D. Analytical approach

6. The ex-ante cost-benefit analysis was designed to estimate standard economic and financial indicators including: Economic and Financial Net Present Value (ENPV and FNPV) at private and social prices over a 20-year period, Financial and Economic Internal Rates of Return (EIRR and FIRR), Benefit/Cost (B/C) ratio and payback period. These indicators were calculated for the: (i) overall project, (ii) project components, (iii) subcomponents, and (iv) activities and technologies. Sensitivity and scenario analysis was carried out to explore the likely impacts of possible changes in key variables such as benefits, costs and GHG reduction emissions.

E. Assumptions and parameters

7. All cash flows were estimated using nominal prices. The exchange rate for converting from Turkish Lira (TL) to US dollar was the average value registered in 2020. In the baseline scenario, the cost of capital and the social discount rate were 6 percent. The project evaluation period was 20 years. The values of conversion factor from private to social prices used for this analysis are presented in the Table 3.2. Other specific assumptions and parameters were used to estimate the economic and financial indicators by component, subcomponent, activity and/or technologies (excel calculation model).

Table 3.2: Conversion factor from private to social prices

Conversion factor from private to social price	Value
A. Outputs	
Crops - exported	0.8
Crops - local consumptions	1
Livestock	1
B. Inputs - Investment	
Other inputs	1
Fertilizers/pesticides/veterinary products - imported	1.04
Fertilizers/pesticides/Veterinary products - locally produced	1
C. Operating inputs	1
D. Labor force - Unskilled	0.6
E. Labor force - Skilled	1
F. Shadow exchange ratio	0.96
G. Shadow price of carbon (world bank: conservative scenario) – forecast 2020 to 2041	2022: 42 2041: 64

F. Overall results

8. The estimated values of the economic and financial indicators are presented in Table 3.3 taking into consideration the total project costs (including governmental and beneficiary counterparts). The positive NPVs and IRRs, above the cost of capital and social discount rate, show that, overall, the resources invested in the project generate positive returns on investment, both financially and economically. Without considering the environmental benefit reflected in the reduction of GHG, the Economic NPV and IRR are estimated at US$166.4 million and 6.6% respectively. The investment would have negative results in financial terms if the cost of capital were 7%.

9. Considering a scenario of high carbon prices in the future (according to the World Bank forecast), the ENPV and EIRR would increase significantly until US$456.5 million and 7.8%, respectively. Table 3.4 shows the hypothetical ENPV, FNPV and EIRR changes in responses to variation of social discount rate, cost of capital and exchange rate.

Table 3.3: Ex ante cost-benefit analysis – Summary results

Financial indicators			
Financial Net Present Value (FNPV) (US$ million)	Financial Internal Rate of Return (FIRR) (%)	Benefit/Cost Ratio	Payback period (years)
121.1	6.43	1.14	12.95
Economic indicators			
Economic Net Present Value (ENPV) (US$ million)	Economic Internal Rate of Return (EIRR) (%)	Benefit/Cost Ratio	Payback period (years)
311.6	7.23	1.28	12.38

Table 3.4: Ex ante cost-benefit analysis – Hypothetical scenarios

Social discount rate (hypothetical changes)	**ENPV (US$ million)**
Base scenario (6 %)	311.6
Minimum value (5 %)	612.3
Higher value (7 %)	53.9
Cost of capital (hypothetical changes)	**FNPV (US$ million)**
Base scenario (6 %)	311.6
Minimum value (5 %)	438.8
Higher value (8 %)	(-150.5)
Exchange rate (TL/US$)	**FIRR (%)**
Base scenario (1 US$ = 7.01 – average value 2020)	6.43
Conservative scenario (1US$ = 8.5 TL)	6.19
Pessimistic scenario (1US$ = 10 TL)	5.97

10. Sensitivity analysis was carried out to determine the robustness of above presented results under a range of hypothetical changes of key variables. Table 3.5 shows the different EIRR values. Despite a moderately pessimistic scenario, in terms of interest rate increases and devaluation of the local currency in relation to the US$ dollar, the project would have positive returns on investment in economic terms. In addition, the sensitivity analysis reveals that the EIRRs are more sensitive to changes in producer revenues, production costs, but less sensitive to changes in carbon prices.

Table 3.5: Sensitivity analysis

Parameter	EIRR values (percent)						
	-20%	**-10%**	**-5%**	**0%**	**5%**	**10%**	**20%**
Producer revenues	6.26	6.80	7.02	7.23	7.42	7.59	7.89
Production costs	7.89	7.56	7.39	7.23	7.07	6.9	6.57
Carbon price	7.12	7.17	7.2	7.23	7.26	7.29	7.34

G. Disaggregated results

11. **Component 1.** Tables 3.6 to 3:11 show the economic and financial indicators for the different project's components and subcomponents. Table 3:12 presents the Financial Internal Rate of Return of specific technologies/activities proposed by the project.

Table 3.6: Ex ante cost-benefit analysis – Component 1

Financial indicators			
Financial Net Present Value (FNPV) (US$ million)	Financial Internal Rate of Return (FIRR) (%)	Benefit/Cost Ratio	Payback period (years)
39.1	6.80%	1.07	12.88
Economic indicators			
Economic Net Present Value (ENPV) (US$ million)	Economic Internal Rate of Return (EIRR) (%)	Benefit/Cost Ratio	Payback period (years)
142.6	9.34%	1.31	11.37

Table 3.7: Ex ante cost-benefit analysis –Component 1 (SC 1.1 and SC1.2)

Subcomponent	**FNPV (US$ million)**	**FIRR (%)**	**B/C**	**Payback period (year)**
Subcomponent 1.1	34.8	6.72%	1.06	12.94
Subcomponent 1.2	**4.4**	14.44%	1.27	9.71
Subcomponents	**ENPV (US$ million)**	**EIRR (%)**	**B/C**	**Payback period (year)**
Subcomponent 1.1	137.1	9.25%	1.30	11.92
Subcomponent 1.2	5.6	17.73%	1.40	8.85

Table 3.8: Ex ante cost-benefit analysis – Component 2

Financial indicators			
Financial Net Present Value (FNPV) (US$ million)	Financial Internal Rate of Return (FIRR) (%)	Benefit/Cost Ratio	Payback period (years)
34.6	8.59%	1.43	12.98
Economic indicators			
Economic Net Present Value (ENPV) (US$ million)	Economic Internal Rate of Return (EIRR) (%)	Benefit/Cost Ratio	Payback period (years)
41.7	9.25%	1.54	12.50

Table 3.9: Ex ante cost-benefit analysis –Component 2 (SC 2.1 and SC2.2)

Subcomponent	FNPV (US$ million)	FIRR (%)	B/C	Payback period (year)
Subcomponent 2.1	7.1	7.07%	1.50	11.59
Subcomponent 2.2	27.4	10.29%	1.42	14.01
Subcomponents	**ENPV (US$ million)**	**EIRR (%)**	**B/C**	**Payback period (year)**
Subcomponent 2.1	8.9	7.40%	1.61	11.35
Subcomponent 2.2	32.7	11.42%	1.52	13.40

Table 3.10: Ex ante cost-benefit analysis – Component 3

Financial indicators			
Financial Net Present Value (FNPV) (US$ million)	Financial Internal Rate of Return (FIRR) (%)	Benefit/Cost Ratio	Payback period (years)
47.5	6.21%	1.21	12.96
Economic indicators			
Economic Net Present Value (ENPV) (US$ million)	Economic Internal Rate of Return (EIRR) (%)	Benefit/Cost Ratio	Payback period (years)
127.2	6.65%	1.22	12.65

Table 3.11: Ex ante cost-benefit analysis –Component 3 by subcomponent

Subcomponent	FNPV (US$ million)	FIRR (%)	B/C	Payback period (year)
Subcomponent 3.1	11.5	11.07%	1.45	10.15
Subcomponent 3.2	28.3	6.16%	1.09	13.04
Subcomponent 3.3	3.8	7.52%	1.02	12.14
Subcomponent 3.4	3.8	6.11%	1.11	12.83
Subcomponents	**ENPV (US$ million)**	**EIRR (%)**	**B/C**	**Payback period (year)**
Subcomponent 3.1	11.6	11.42%	1.47	10.01
Subcomponent 3.2	62.5	6.39%	1.22	12.87
Subcomponent 3.3	22.3	15.20%	1.13	8.75
Subcomponent 3.4	30.8	6.99%	1.32	12.16

Table 3.12: Financial Internal Rate of Return of specific technologies/activities proposed by the project

Subcomponent	Technology/activity	FIRR	EIRR	B/C (financial)
Subcomponent 3.1	Pilot model for greenhouse-clustering production linked to efficient energy use	11.1	11.4	1.45
	Smart Farm Management and Decision Support System	6.04	6.07	1.15
	Digitally assisted steering systems - Manuel Aided Steering Systems Treamline System (MASSTS)	6.56%	8.91%	1.18

Subcomponent 3.2	Digitally assisted steering systems - Manuel Aided Steering Control Systems (MASSCS)	7.39%	7.63%	1.15
	Digitally assisted steering systems - Automated steering systems (ASS)	6.51%	7.06%	1.03
	Variable rate technologies (VRTs)	6.40%	7.05%	1.03
Subcomponent 3.3	Reducing animal (mainly from cattle) production pressures on water pollution and GHG emissions	7.5%	15.2%	1.02
Subcomponent 3.4	Pesticides management	6.10%	7.01%	1.04
	Fertilizer management	6.04%	7.60%	1.08
	Improvement of soil health	6.22%	7.60%	1.25
	Climate change technologies - Water	6.20	6.49%	1.05
	Climate change technologies – dairy sector	6.01%	6.7%	1.08

H. Conclusion

- The overall project investment would generate positive returns, in both financial and economic terms. The estimated FIRR exceeds the cost of capital, and the estimate EIRR exceeds the social discount rate used for this analysis.
- The project investment for each component would generate positive returns, in both financial and economic terms.
- The project investment for each subcomponent would generate financial and economic positive returns.
- The project investment for each technology and activity proposed by the project would have positive yields in financial and economic terms.

ANNEX 4: Climate Change and Greenhouse Gas Analysis

COUNTRY: Turkey
Climate Smart and Competitive Agricultural Growth Project

Introduction

1. Turkey is surrounded by sea on three sides, which in combination with the extensive mountains and diverse nature of the landscape result in significant differences in climatic conditions across regions. Milder climate is influenced by the sea in coastal regions, and continental climate is seen in the inner parts of Turkey. This makes the country particularly vulnerable to the adverse effects of climate change and justifies the country's motivation to promote measures to increase its climate resilience and adaptation. A large part of the country is in the Mediterranean subtropical zone making Turkey a medium-high risk country in terms of both climate change and variability. Reference climatological variables already indicate an increase in mean annual temperature from 13.2ºC (degrees Celsius) to 13.5 ºC from 1971-2000 to 1981-2010 period. The mean annual long-term rainfall is around 574 millimeters, but precipitation has decreased over the near past while the one-day maximum precipitation has increased. The country has recognized the vulnerability of the agricultural sector to climate change impacts and reflected this in its National Climate Change Adaptation Strategy and Action Plan. While the agricultural sector is highly vulnerable to climate change, it is also seen as an important part of the climate solutions. Mitigation opportunities in the agricultural sector are closely linked to the protection of natural resources and reduction in energy consumption in the sector (see Box 1).

Box 1. Agriculture in National Climate Change Policies

Turkey has included agriculture in its **National Climate Change Action Plan (2011-23)** and has prioritized measures to achieve both, mitigation and adaptation benefits.

a) Mitigation: activities in agriculture are formulated around three strategic objectives: (i) increasing the sink capacity of the sector, (ii) reducing GHG emissions, and (iii) developing information infrastructure and capacity. Activities to support the first objective are highly linked to the soil health agenda, including assessing soil carbon stocks, establishing a parcel identification system, preparing erosion maps and crop suitability maps, developing a national pasture information system, supporting effective pasture management and crop rotations, completing irrigation infrastructure, and developing an information system on land consolidation. Activities to reduce GHG emissions include disseminating precision agriculture, supporting integrated pest management (IPM) systems, limiting GHG emissions from livestock, and increasing renewable energy use in the sector. For information infrastructure, the Plan proposes to build an information infrastructure that will help the agri-food sector adapt to and combat climate change, and to determine and monitor soil carbon content, among other actions. In addition, **Turkey's Intended National Determined Contributions (INDC)** to reduce emissions in agriculture include the following strategies: saving energy (fuel) through land consolidation initiatives in agricultural areas, rehabilitating grazing lands, controlling the use of fertilizers, implementing modern agricultural practices, and supporting minimum tillage methods.

b) Adaptation: Agriculture and Food Security has been prioritized, both in the National Climate Change Action Plan (2011-23) and the **National Climate Change Adaptation Strategy and Action Plan**[76], with objectives about mainstreaming climate adaptation among agriculture & food security policy, supporting R&D, supporting sustainable planning of water utilization in agriculture, protecting soil and agriculture biodiversity against climate change, and supporting institution capacity and

[76] A new National Adaptation Strategy for the period 2014-2030 is currently being prepared by the GoT, with support of the United Nations Development Program (UNDP). The GoT has also committed to prepare a 2023-2030 Climate Change Action Plan and 2050 Climate Change Strategy.

interagency cooperation in relation to adaptation alternatives in the sector.

- The Eleventh Development Plan (DP) (2019–23) supports the creation of an efficient and more competitive agricultural sector that is environmentally, socially, and economically sustainable; balances supply and demand; and delivers adequate and balanced nutrition to the people.[77] In the policy and regulatory front, the Plan's focus is towards tracking issues of land fragmentation and misutilization; enhance agricultural planning and sectoral information; enhance the efficiency of agricultural subsidies; and support market regulation. In the public services front, the Plan aims at strengthening R&D efforts; enhance extension services; provide insurance coverage; and enhance food safety, sanitary and phytosanitary capacity. In the investment front, the Plan focuses on expanding crop production along with achieving a more climate resilient, productive and resource efficient sector.

- The Strategic Plan of the Ministry of Agriculture and Forestry (MoAF) 2019–2023 emphasizes the protection of natural capital, significant improvements in resource-use efficiency, and enhanced information systems that incorporate economic, social, and environmental considerations in land-use planning and policy decisions. The Plan supports the promotion of CSA, improved postharvest and logistics infrastructure, and stronger market coordination to save energy and water, reduce postharvest losses, limit food waste, and reduce price inflation.

- The New Economic Plan 2020–2023[78] identifies several venues to improve agricultural production and productivity and reduce food price inflation. These focus on reducing the seasonality of production, increasing production (including domestic production of imported commodities), and developing opportunities for a new generation of agri-food entrepreneurs by supporting research to develop high-yielding varieties, expanding the use of certified seed, promoting contract farming, providing input-based support, promoting more efficient crop rotations, expanding greenhouses and irrigation, undertaking studies on early warning systems (to accurately forecast food supplies), and establishing a market for agriculture products stored in licensed warehouses via an electronic tracking system.

- The Economic Reform Program 2021–2023[79] identifies reforms to stabilize food prices as a top priority for building a resilient food system and addressing food security. The reform program proposes to create a Price Stability Committee and to establish an early warning system to forecast food crop production, yields, and prices. It also advocates a set of measures and investments to deal with food price inflation already included in the New Economic Plan 2020-23.

2. The project will support the GoT to meet its adaptation and mitigation objectives in the agricultural sector. It will do this by supporting under Component 1 the generation and proper consolidation of critical soil and land information to support decision making process across a wide range of users, and specific objectives, such as: (i) conservation of fertile land and enhance its sustainable management; (ii) protection and enhancement of soil carbon sinks; and (iii) sustainable agricultural practices in accordance with local soil/landscape features. Component 2 will support building resilience of animal surveillance and health system, a key pillar to strengthen the country capabilities to manage (i) physiological and immune responses in livestock driven by climate conditions (droughts, fires, heat stress etc.) and (ii) increased incidence and spread of pathogenic outbreaks due to changing climate.[80] Component 3 will support subproject investments in CSA. It will specifically promote the use of digital agriculture technologies in small and medium farms which will improve resource use efficiency including energy and agrochemical use, improve productivity which will reduce pressure on soil and land resources. Interventions will promote renewable energy uses in agriculture including manure-based biogas production and infrastructure to promote geothermal-heated greenhouse models. According to literature, the agricultural sector consumes on average around 399,600 tons of oil equivalent of petroleum and 499.1 GWh annually.[81] Any energy savings or use of renewable energy can potentially have a significant impact on reducing carbon dioxide (CO_2). The installation of sensors and on-farm weather stations are also important to support water resources

[77] Presidency of the Republic of Turkey and Presidency of Strategy and Budget (2020). 100th Year Turkey Plan. Eleventh Development Plan (2019–2023). Ankara. [Official English translation.] Available at: *https://www.sbb.gov.tr/wp-content/uploads/2020/06/Eleventh_Development_Plan-2019-2023.pdf*.

[78] Released in September 2020.

[79] Released by the President on March 12, 2021.

[80] *https://www.fao.org/3/ca8946en/CA8946EN.pdf*

[81] *http://annals.fih.upt.ro/pdf-full/2016/ANNALS-2016-4-17.pdf*

management, improve adaptation and reduce energy consumption. Management of livestock and manure will reduce methane and nitrous oxide emissions. Plus, recovery energy and biofertilizer production from manure management will displace fossil fuel sources. The project will also support training experts on CSA practices tailored from research and innovation to build the know-how on CSA and enable dissemination of practices and technologies suited for small/medium farmers.

Climate change vulnerability

3. As per the National Adaptation Strategy, the climate of Turkey is expected to undergo significant changes over the coming decades. Temperatures are expected to rise by 2.5-4°C on average reaching up to 5°C in inner region and up to 4°C in the Aegean and Eastern Anatolia and the precipitation will be significantly reduced in these regions, leading to prolonged droughts. There will also be a significant increase in the number of consecutive dry days across the country and the number of days with frost will decrease. This situation is expected to have negative impacts on water and soil resources that are essential for food production and security. It is anticipated that 50% of the surface waters in the Gediz and Greater Menderes Basins will be lost by the end of the century and that water scarcity will increase. This will particularly affect the agricultural sector where 66% of agricultural land is irrigated. Furthermore, changes in temperature and precipitation patterns will increase agricultural pest manifestation. Climate change is also a major factor impacting animal health and welfare. Direct effects are primarily due to increased temperatures, frequency and intensity of heat waves which causes significant stress for animals and impacts their reproduction and productivity. Indirectly climate change affects the survival, reproduction, abundance and distribution of pathogens, vectors and hosts. Overall, given the climate change projections for Turkey, the agricultural sector (crops and livestock) will be highly exposed to climate change that could trigger food insecurity. This has increased the government's urgent need to strengthen resilience and adaptive capacity in agricultural systems to enhance climate adaptation and mitigation support to farmers.

Table A4.1: Projected impacts of climate change in agriculture sector

Impacts	Severity	Region or Province	Sector or Theme
Declining of surface water	Medium	West Anatolia	Agriculture, infrastructure of water distribution network
Forest Fires		West Anatolia	Tourism, agriculture
Increase in shortage of usage water		Afyon, Izmir, Kayseri, Mugla, Manisa	Agriculture, industry, energy
Flood		Black Sea, Southeast Anatolia	Survival of farms, human health
Landlessness/loss of soil		Southwest Anatolia	Farms' survival, food security, shallow lakes, and wetlands
Decrease in agricultural productivity		Mediterranean, Aegean	Agriculture (employment), food security
Change in river/basin regimens	Low	All	Ecosystem services and biodiversity
Soil losses/salinity		Mediterranean, Black Sea, Aegean	Tourism, ecosystem services, biodiversity, seafood
Disruptions of marine ecosystems		Mediterranean, Black Sea, Aegean	Ecosystem services and biological diversity
Migration of species		Mediterranean	Tourism, agriculture, food security
Decrease in seafood production		Mediterranean	Agriculture, food security, water distribution network
Costal erosion		Black Sea	Fishing, unemployment

Source: Ministry of Environment, Urban and Climate Change, Turkey's National Climate Change Adaptation Strategy and Action Plan 2011-2023

4. Given the sheer size of the country, the climate change impacts will be felt differently within each region and production system, whether it is cereal crops (wheat, rice, maize), fruits (citrus, viticulture), grasslands (e.g., dairy, sheep), horticulture or forestry (natural and plantation). According to Dellal et al, 2016[82] climate change will decrease yields for corn (-7.2 to -15.7%), rice (-7.3 to -12.5%), sugar-beet (-4.5 to -15.8%) and legumes (-2.8 to -11.8%). Additional challenges from increased waterlogging and incidence of pests and diseases are also likely to occur. At the broader national level increased climate variability and extreme events will impact the seasonality and availability of forage from pastures which will increase the vulnerability of livestock production. Higher temperatures will also impact the wellbeing of animals. Furthermore, warmer temperatures could increase the incidence of animal diseases.[83] A higher livestock disease burden will increase the use of veterinary medicine which needs to be carefully controlled, for example to reduce the risk of any potential toxins entering the food chain. Adaptation strategies and practices will therefore need to differ between crops, grasslands and livestock sub-sectors.

Project's potential climate adaptation contribution

5. The project will contribute to specific adaptation actions identified in Turkey's climate change action plan (2011-2023) and other relevant sector developmental strategies as presented in Table A.4.2.

GHG accounting overview

6. **Methodology.** The project GHG impact was calculated using the WB approved tool EX-Act. EX-ACT allows the assessment of a project's net carbon-balance, defined as the net balance of CO_2 equivalent GHG that were emitted or sequestered as a result of project implementation compared to a without project scenario. EX-ACT estimates the carbon stock changes (emissions or sinks), expressed in equivalent tons of CO_2 per hectare and year. The GLEAM tool is used to account for impacts from improvements in veterinary health surveillance and medical products.

7. **Key assumptions.** The project region has a warm temperate climate with a dry regime. The dominant soil type is High Activity Clay. The project implementation period is six years, and the capitalization phase is assumed to be 14 years. The 20 years accounting period is standard in the use of EX-ACT and in line with the economic and financial analysis. The assessment uses a mix of tier 1 and tier 2 emission factors to calculate the benefit.

8. **Project Boundary**. The proposed assessment accounts for activities reducing the rate of land use changes from fertile agriculture to non-agricultural uses under Subcomponent 1.1, investment in Component 2 and subprojects/pilots in Component 3. Investment in subprojects on variable rate, assisted driving technologies will reduce fertilizers use and fuel use as well as decision support tools/technologies that improve soil management i.e crop rotations, residue management etc. Investments in close-cycled geothermal infrastructure for greenhouse vegetable production will displace the potential use of fossil fuel. Production of biogas from manure management will produce biogas for heating/electricity and substitute fertilizers with processed manure-based organic fertilizers in fields. Pilot demonstrations will target improved agricultural practices i.e. IPM, nitrogen fixing cover crops, reduced tillage, etc.

9. **Data Sources.** The main source of data came from information provided by the various departments within MoAF and are complemented with national and global literature.

[82] The impacts of climate change on the agriculture. International Agriclture Insurance Symposium.
[83] *https://www.sciencedirect.com/science/article/pii/S0167587716306912*;
https://centaur.reading.ac.uk/70792/1/Mitigation%20Manuscript%20-%20Agriculture%20Ecosystem%20and%20Environment%20final.pdf
https://www.frontiersin.org/articles/10.3389/fvets.2020.557190/full

Table A.4.2: Summary of project climate co-benefits per activity

Main Activity	Adaptation	Mitigation
Subcomponent 1.1- Narrowing information gaps to enhance soil health and land-use planning/management		
Soil surveys and data	Soil surveys generate key soil data needed to promote healthy soils. Healthy soils make land more resilient to higher temperatures, drought and floods through regulation of drainage, flow, and water storage functions. During wetter periods healthy soil act as filters and reservoirs increasing resilience to extreme or frequent rainstorms. During increase heat/droughts, healthy soils have higher water-holding capacity and regulate better soil temperature.	Increase or maintain carbon stock in soils. Current soil health situation guides decision to improve soil healthy. Healthy soils in protected fertile agricultural land have greater carbon stocks and can maintain or sequester carbon more effectively.
Soil and land information (SLIS)	Digital soil and land data duly integrated and readily available in spatial information infrastructure will strengthen decision making to enhance resilience to climate change. SLIS informs soil conservation program and reduces erosion and soil degradation. The National Soil and Land Information System (SLIS), including related sub-systems, will contribute to guide climate change adaptation strategies. Dynamic soil and land modeling sub-module in SLIS supports the effective use of data for planning and policy decisions on land use.	The National Soil & Land Information System (SLIS), particularly, the subsystem for organic carbon monitoring is expected to guide climate change mitigation strategies in agricultural designated lands.
Soil and land mapping	Detailed soil map 1:5k supports sustainable agriculture land use planning to reduce vulnerability to soil erosion and nutrient loss i.e. reduce tillage, crop cover, improve grazing etc. Soil maps support crop diversification assessments in line with agro-ecological zoning and changing climate conditions.	Definition of the agricultural frontier based on technical parameters strengthens legislation protecting fertile agricultural land and reduces pressure on land use changes.
Agricultural land planning/notes	DST on land use planning at the provincial level prevents uncontrolled land use changes and promotes sustainable land use planning i.e. soil conservation and management practices etc.	-The soil and land information support preparation of sustainable land use plans to reduce land use changes, land degradation and erosion in fertile agricultural lands. -Land notes provide transparent information clearly identifying fertile agriculture available to reduces pressure on land conversion to non-agricultural uses.
Soil monitoring system	The soil monitoring subsystem will allow to track soil health to ensure that soils function important for climate regulation are protected. It will help monitor erosion and soil organic carbon stocks to enhance resilience.	
Training and dissemination	Institutional capacity building and training support farmers on soil management. Wide dissemination of information systems (soil and land information; the subsystem soil organic carbon,	

Main Activity	Adaptation	Mitigation
	sustainable integrated land use planning tool) with public and private stakeholders contributes to reduce land use changes and other stressors i.e., degradation, erosion which are exacerbated by extreme, intensive, and frequent rainfall, flooding drought and heat, etc.	
Subcomponent 2.1 and 2.2 Animal Health-related investments		
Upgrading of animal health institutes	Veterinary infrastructure and services contribute to improve detection and surveillance to deal with increased occurrence, distribution of infectious disease linked to higher temperatures and changes in patterns and intensity of precipitation events.	Energy efficiency consideration will be incorporated in civil works and laboratory equipment purchase. Healthier animals are more productive and have lower emission intensity than sick animals. This has been demonstrated for several diseases i.e., mastitis increased generation of GHG by 7-8% and for foot and mouth disease is 3.5% higher (FAO report).
Veterinary Medicine control center	Veterinary medication control system ensures availability of safe drugs to deal with projected increase demand for medication to treat animal physiological and immune responses to climate factors as well as increased disease burden on animal populations due to climate change.	
Subcomponent 3.1 Strengthening resilience productivity and resources use efficiency in horticultural production		
Pilot model for closed geothermal-based cluster greenhouses	Geothermal-heated greenhouses are more resilient to weather shocks and can withstand the variability of climate events including colder shocks and heavy windstorms compared to traditional greenhouses. The project will enable the transition of private investors to this type of infrastructure and increase resilience of horticulture production in the country. This is expected to be an indirect co-benefit of the project once the private sector builds greenhouses.	Generation of renewable geothermal energy in closed cycle system for direct heat/energy use in greenhouse cluster. Zero GHG emission is assumed since a pumped, closed cycle, binary technology is to be used, according to ESMAP.
Subcomponent 3.2 Adoption of Climate-Smart Agriculture practices and/or technologies		
Digitalization and innovation	Improve productivity and resiliency by using location-specific climate data, weather forecasts, and future outlooks to support farmer's decisions. Enabling the institutional, technical, and legislative to promote smart farming technologies. Demonstration and training as well as information portals will enhance knowledge and uptake of climate-smart farming.	
Grant support for CSA technologies		Reduction of GHG from improved agricultural technologies (driver assistance, variable rate fertilizer application that reduce energy consumption, fertilizers, and pesticides inputs and decision support tool that increases sustainable soil management and production practices)
Subcomponent 3.3 Reducing animal production pressures on water pollution and GHG emissions		
Centralized manure management and		Manure management via anaerobic digestion, digestate substitutes chemical

Main Activity	Adaptation	Mitigation
biogas production pilot		fertilizers and biogas capture is used for energy production. Field application of good agricultural practices in demonstration livestock and crop such as reduced tillage and high soil carbon management i.e. crop cover, crop rotation systems, green manures, residue management and manure application among others.
Subcomponent 3.4 CSA RD&I		
Research and innovation in agriculture	Climate change awareness with agribusinesses and provincial governments and capacity building of extension providers on climate. Climate and carbon footprint to inform crop planning, policy, and programs.	Reduction of emissions from training extension and experts on the use of microbiological & biological fertilizers in legume displace chemical fertilizer; natural controls and integrated pest management reduce pesticides; reduced tillage and non-till. Indirectly this investment will generate co-benefits once know how is shared with farmers.

10. **Modeling and Assumptions.** The summary of the EX-Act modules and GHG mitigation attributions are summarized for each of the submodules below.

Table A4.3 Modeling of mitigation impacts in EX-Act

Component/ Subcomponent	Mitigation attribution	Land area	EX-Act Module	Eligibility (Rev. MDB Mitigation Methodology)[84]
Subcomponent 1.1	Avoided land-use changes from fertile agricultural land to non-agricultural uses. The GoT introduced Law 5403/ 2015 to protect irrigated and fertile agricultural lands from conversion to other uses unless absolutely necessary and apart from marginal land. The land classification to be done as part of this project will define the boundaries and protect fertile agricultural land. According to national information about 700,975 ha of agricultural land was allowed for non-agricultural use during the 2005-2017,~61.7% of this land was dry marginal agricultural land and 23.8% was absolute agricultural land[85]	Fertile agricultural lands converted to non-agricultural uses reached 166,832 ha over 12-year period. This is 13,903 ha annually. If we assume that 100% of this will be avoided because of the project that will be 55,611 ha	Land use model submodule other land use changes Scenarios With project: agricultural land will not be changed to non-agricultural land Without project land will be changed from agricultural to non-	Table 4 activity 2 of the MDB Methodology report

[84] As per World Bank Report-Revised MDB Mitigation Finance Tracking Methodology Implementation starting FY22.
[85] *http://cevreselgostergeler.csb.gov.tr/en/misuse-of-agricultural-areas-i-86021*

Component/ Subcomponent	Mitigation attribution	Land area	EX-Act Module	Eligibility (Rev. MDB Mitigation Methodology)[84]
			agricultural	
Component 2	Healthier animals are more productive and thus produce lower emissions per unit of output i.e. GHG per liter of milk. Literature indicates that there is between 4 - 5% reduction in GHG emissions in milk produced from healthier animals when compared to sicken animals with Bovine Viral Diarrhea Virus. [86] Reducing the prevalence of diseases/parasites through prevention, control and treatment including biosecurity and containment, detection testing and vaccination abatements is therefore a viable mitigation option to reduce emission intensity of animal products.	Assumed that grassland production system, with 8.33% adult female cows inflected.	Model in GLEAM more cows will be needed to produce the same amount of milk	Table 4 activity 4 of the MDB Methodology report
		Construction of buildings. With the project the buildings will be green- mostly energy efficient. Without project the buildings will not have a green/energy efficiency construction	Ex-Act inputs module – buildings subsection. 3590 m2 emission factor was reduced by 10% to capture improvements in energy efficiency	Table 4 activity 1 of the MDB Methodology report
Subcomponent 3.1	Pilot of geothermal-heated greenhouses in closed systems. Wells to generate geothermal energy heating for vegetable production in greenhouses	The project will support a closed system geothermal-heated greenhouse pilot of 179 ha. Assumption is that the project displaces fossil fuel. The project will generate 150MW thermal per year which is equivalent to 5.91 MWh per MWt [87]	Submodule Inputs-energy With project heat needs are provided through closed cycle geothermal energy Without project heat will be provided with electricity.	Table 1 activity 1 and Table 4 activity 3 of the MDB Methodology report
Subcomponent 3.2.1	Precision agriculture assisted machine guidance technology for small and medium farmers. A reduction in fertilizers 2.2% is expected	Estimated area of intervention 157,073 ha	Module Inputs& Investments Submodules Agrochemicals and Energy With project	Table 4 activity 1 and 3 of the MDB Methodology report

[86] *https://dairysustainabilityframework.org/wp-content/uploads/2020/10/Dairy-Cattle-Health-and-GHG-Emissions-Pilot-Study-Report.pdf*
[87] Based on study Research sustainability Geothermal Wells in the Netherlands Energy pay-back time, Life cycle analysis and social cost benefit analysis, Project no: E15016, January 2017.

Component/ Subcomponent	Mitigation attribution	Land area	EX-Act Module	Eligibility (Rev. MDB Mitigation Methodology)[84]
	and 10% fuel diesel[88]		reduction of fuel and fertilizer Without project no reduction.	
Subcomponent 3.2.2	Precision agriculture[89] variable rate application technology for small and medium farmers. A reduction in fertilizers 5% is expected	Estimated area of intervention 189,248 ha	Module Inputs& Investments Submodule Agrochemicals With project reduction of fertilizer Without project no reduction.	Table 4 activity 3 of the MDB Methodology report
Subcomponent 3.2.2	Decision Support Tools/technologies will be used by farmers which will improve and promote the implementation of more sustainable practices such as soil carbon management i.e. crop covers/rotations/residue management etc.	Estimated area of intervention 197,245.5 ha	Module cropland Submodule annual crops With project high carbon input no manure practice and reduced tillage Without project reduce tillage and low carbon input	Table 4 activity 3 of the MDB Methodology report
Subcomponent 3.3	Pilot on integrated and innovative approaches on manure management at community level. Centralize collection in adequate facility and linked to biogas production facility for electricity generation and feed to grid. Applied digestate in soil to substitute for fertilizers.	5,000 heads dairy smallholder 5,000 heads dairy medium holder	Module grassland submodule livestock management With project manure management with digester Electricity-biogas production included in input Without project left in the farm Digestate included in inputs chemical fertilizers equivalent	Table 4 Activity 4 and Table 1 Activity 1 of the MDB Methodology report

[88] Vatsanidou, Anna & Fountas, Spyros & Liakos, Vasileios & Nanos, G. & Katsoulas, Nikolaos & Gemtos, T. (2020). Life Cycle Assessment of Variable Rate Fertilizer Application in a Pear Orchard. Sustainability. 12. 6893. 10.3390/su12176893

[89] Belafoutis, A. et al, 2017. Precision Agriculture Technologies Positively Contributing to GHG Emissions Mitigation, Farm Productivity and Economics. Sustainability. Vol. 9, 1339 *http://www.mdpi.com/journal/sustainability.*

Component/ Subcomponent	Mitigation attribution	Land area	EX-Act Module	Eligibility (Rev. MDB Mitigation Methodology)[84]
			at N without project and as compost with project	
	Demonstration farms to promote applications of good agricultural practices with 1,000 livestock/crop farmers	Estimated area of intervention 14,000 ha	Module cropland Submodule annual crops With project high carbon input with manure practice and no tillage Without project reduce tillage and low carbon input	Table 4 activity 3 of the MDB Methodology report
Subcomponent 3.4	This is an indirect benefit from dissemination of farmers reached from trainers trained by the activities supported by this subcomponent. Reduction in pesticide of 20% due from parcel demonstration of natural and IPM practices. Improve soil and land mgt from cover crops and reduced tillage	7,500 ha 7,500 ha	Module 8 inputs With project 20% less herbicide Module 4 annual crops Without project: tillage and low C retention With project reduce tillage High C retention without manure	Table 4 activity 4 and 2 of the MDB Methodology report

11. **Emission Factors.** Tier 1 emission factors were utilized except for soil organic carbon (SOC) for nonagricultural lands. These were obtained from the National Greenhouse Inventory 2019. For non-agricultural the SOC from settlements was used which was estimated at 20 tC/ha. For biogas-electricity the emission factor was 0.004 tons per MWh. Assessment of animal health mitigation abatement from diagnostics, veterinary testing, biosecurity & containment, and safe vaccination products all enable through investments in component 2.1 and 2.2 was analyzed based on Bovine Viral Diarrhea virus (BVDv) disease. The analysis was run in iGLEAM based on the grassland herd for Turkey, an 8.33% infection rate per year for 3 years after operation of labs and animal drug center during project implementation and 5% reduction in milk yield in sick animals[90]. The assessment estimates the difference in the number of animals needed to produce the same quantity with the presence of disease, as summarized in Table A4.4. Agricultural inputs per year are summarized as shown in Table A4.6, the calculations are included in the calculation sheet in EX-Act.

12. **Summary of Results.** The net-carbon balance quantifies GHGs emitted or sequestered because of the project compared to the without project scenario. This analysis indicates that over a 20-year period, the project reduces/avoids emissions of 5.88 million tCO2-eq. The project will avoid/reduced 294,350 tCO2-eq per year. The calculations datasheet in EX-Act files summarizes details for all the calculations (see Table A4.7 for details).

[90] *https://dairysustainabilityframework.org/wp-content/uploads/2020/10/Dairy-Cattle-Health-and-GHG-Emissions-Pilot-Study-Report.pdf*.

Table A4.4: Summary of livestock inputs used in iGLEAM

Parameter	Turkey	Without project	With project
Heads cattle dairy	501,939	23,716	19,863
Milk yield	2,850	2,708	2,850
Milk fat %	4.1		
Milk Protein %	3.5		
Milk produced tons per year	1.43 million	56,080	

Table A4.6: Summary of agricultural inputs per year used in EX-Act

Input	Without project	With project
Fertilizer (combined) (tons active ingredient)		
Limestone Urea N Manure	1,420 535 1,688 -	1,367 517 179 2,900
Pesticide (ton active ingredient)	44.8	37.1
Energy		
Fuel mobile (diesel) (m3)	5,733	5,160
Buildings- component 2 (m2)	13,590 regular buildings	13,590 green buildings
Electricity (MWh)	886.50	
Electricity displaced from RE from biogas (MWh)	5,638	0

Table A4.7: Summary of Mitigation results per subcomponent in tons CO2eq

Intervention	Without project	with project	Difference
Ex-Act results (a)			
Subcomponent 1.1	3,667,753	-134,409	-3,802,162
Subcomponent 2.1&2.2	3,858	3,867	9
Subcomponent 3.1	15,961	6,282	-9,679
Subcomponent 3.2.1	4,235,177	4,225,386	-27,791
Subcomponent 3.2.2	4,773,033	4,771,652	-1,381
Subcomponent 3.2.3	5,559,826	4,496,828	-1,062,998
Subcomponent 3.3	1,338,659	757,415	-581,244
Subcomponent 3.4	281,521	179,470	-39,051
		Subtotal	**- 5,524,295**
Gleam (b)			
Subcomponent 2.1&2.2*	2,722,806	2,360,101	**-362,705**
		Total (a+b)	**- 5,887,000**

(-) denotes sink/avoided emissions and (*) denotes indirect co-benefits

ANNEX 5: Map of Turkey

COUNTRY: Turkey
Climate Smart and Competitive Agricultural Growth Project