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Report No: PAD00103

INTERNATIONAL DEVELOPMENT ASSOCIATION

PROJECT APPRAISAL DOCUMENT
ON A
GRANT FROM THE GLOBAL AGRICULTURE AND FOOD SECURITY PROGRAM
(GAFSP)

IN THE AMOUNT OF US$20 MILLION

TO THE

KINGDOM OF CAMBODIA

FOR A

CAMBODIA INCLUSIVE LIVESTOCK VALUE CHAINS PROJECT
(CILVCP)
MARCH 10, 2025

Agriculture and Food
East Asia And Pacific

CURRENCY EQUIVALENTS

(Exchange Rate Effective February 28, 2025)

Currency Unit =	CAMBODIAN RIELS
KHR4011.07 =	US$1
US$1.3100 =	SDR1

FISCAL YEAR
January 1 - December 31

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ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
AHICPEP	Avian and Human Influenza Control and Preparedness Emergency Project
AM	Accountability Mechanism
AMR	Antimicrobial Resistance
AWPB	Annual Work Plan and Budgets
CAO	Commune Agriculture Officer
CASDP	Cambodia Agricultural Sector Diversification Project
CAVET	Cambodian Applied Veterinarian Epidemiology Training
CCDR	Cambodia Country Climate and Development Report
CILVCP	Cambodia Inclusive Livestock Value Chains Project
CPF	Country Partnership Framework
CSA	Climate-Smart Agriculture
DA	Designated Account
DAI	Department of Agri-Industry
DPS	Department of Planning and Statistics
EFA	Economic and Financial Analysis
EIRR	Economic Internal Rate of Return
ESCP	Environmental and Social Commitment Plan
ESF	Environmental and Social Framework
ESMF	Environmental and Social Management Framework
ESS	Environmental and Social Standards
FA	Forest Administration
FAO	Food and Agriculture Organization
FIRR	Financial Internal Rate of Return
SOP/FM	Standard Operating Procedures on Financial Management Manual
GAFSP	Global Agriculture and Food Security Program
GAHP	Good Animal Husbandry Practices
GDAHP	General Directorate of Animal Health and Production
GDP	Gross Domestic Product
GHG	Greenhouse Gases
GMP	Good Manufacturing Practices
HACCP	Hazard Analysis and Critical Control Point
HH	Households
IA	Implementing Agency
ICR	Implementation Completion and Result Report
ICT	Information and Communication Technologies
IEC	Information, Education and Communication
IFAD	International Fund for Agricultural Development
IFR	Interim Financial Reports
Kg CO_2e	Kilograms of Carbon Dioxide Equivalent
LASED	Land Allocation for Social and Economic Development Project
LBPl	Livestock Business Plan
MAFF	Ministry of Agriculture, Forestry and Fisheries

MEF	Ministry of Economy and Finance
MFD	Maximizing the Finance for Development
MoE	Ministry of Environment
MoH	Ministry of Health
NDC	Nationally Determined Contribution
NGO	Non-Governmental Organization
NPV	Net Present Value
OER	Official Exchange Rate
PaTecs	Climate-smart technology and practice packages
PDAFF	Provincial Department of Agriculture, Forestry and Fisheries
PDO	Project Development Objective
PGs	Producer Groups
PIM	Project Implementation Manual
PCM	Private Capital Mobilized
PMT	Project Management Team
POAHP	Provincial Office of Animal Health and Production
PPCO	Provincial Project Coordination Office
PPT	Provincial Project Team
PPSD	Project Procurement Strategy for Development
PIT	Project Implementation Team
PSO	Private Sector Operator
RGC	Royal Government of Cambodia
RMF	Results Monitoring Framework
SCF	Standard Conversion Factor
SEP	Stakeholder Engagement Plan
SME	Small and Medium Enterprise
SOP	Standard Operating Procedures
STEP	Systematic Tracking of Exchanges in Procurement
TA	Technical Assistance
TADs	Transboundary Animal Diseases
ToC	Theory of Change
ToR	Terms of Reference
TSP	Technical Service Provider
USAID	United States Agency for International Development
VAHW	Village Animal Health Worker
WB	World Bank
WOP	Without Project
WP	With Project
Z-TWG	Zoonotic Technical Working Group

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DATASHEET

BASIC INFORMATION

Project Beneficiary(ies)	Operation Name		
Cambodia	Cambodia Inclusive Livestock Value Chains Project		
Operation ID	Financing Instrument	Environmental and Social Risk Classification	
P180535	Investment Project Financing (IPF)	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
[ ] Alternative Procurement Arrangements (APA)	[ ] Hands-on Expanded Implementation Support (HEIS)

Expected Approval Date	Expected Closing Date
10-Mar-2025	31-Dec-2029
Bank/IFC Collaboration	
No	

Proposed Development Objective(s)

The Project Development Objective is to sustainably improve livestock-based livelihoods and strengthen animal health services in target project locations.

Components

Component Name	Cost (US$)
Component 1. Promote Inclusive and Sustainable Livestock Value Chains	12,190,000.00

Component 2. Enhance Animal Production and Health Services	5,482,800.00
Component 3. Project Management, Monitoring, Evaluation, and Learning	2,327,200.00

Organizations

Borrower:	KINGDOM OF CAMBODIA		
Contact	Title	Telephone No.	Email
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Implementing Agency:	Ministry of Agriculture, Forestry and Fisheries (MAFF)		
Contact	Title	Telephone No.	Email
H.E. Pyseth MEAS	Secretary of State	+85512759440	pysethmeas1@gmail.com

PROJECT FINANCING DATA (US$, Millions)

Maximizing Finance for Development

Is this an MFD-Enabling Project (MFD-EP)? Yes

Is this project Private Capital Enabling (PCE)? No

SUMMARY

Total Operation Cost	**22.17**
Total Financing	**22.17**
Financing Gap	**0.00**

DETAILS

World Bank Group Financing

Non-World Bank Group Financing

Commercial Financing	2.17

Unguaranteed Commercial Financing	2.17
Trust Funds	20.00
Global Agriculture and Food Security Program	20.00

Expected Disbursements (US$, Millions)

WB Fiscal Year	2025	2026	2027	2028	2029	2030
Annual	0.80	3.00	3.50	3.70	5.50	3.50
Cumulative	0.80	3.80	7.30	11.00	16.50	20.00

PRACTICE AREA(S)

Practice Area (Lead)

Agriculture and Food

Contributing Practice Areas

SYSTEMATIC OPERATIONS RISK- RATING TOOL (SORT)

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

POLICY 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

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

E & S Standards	Relevance
ESS 1: Assessment and Management of Environmental and Social Risks and Impacts	Relevant
ESS 10: Stakeholder Engagement and Information Disclosure	Relevant
ESS 2: Labor and Working Conditions	Relevant
ESS 3: Resource Efficiency and Pollution Prevention and Management	Relevant
ESS 4: Community Health and Safety	Relevant
ESS 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	Not Currently Relevant
ESS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	Relevant
ESS 7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	Relevant
ESS 8: Cultural Heritage	Relevant
ESS 9: 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

Legal Covenants

Sections and Description
Institutional Arrangements Grant Agreement: Schedule 2, Section I.A Recurrent, Continuous (a) maintain throughout Project implementation (i) a Project Management Team within MAFF, to be responsible for Project management, including financial management, environmental and social risk and impact management, overall coordination of Project

activities, external communication, preparation of Annual Work Plans and Budgets and procurement plan(s), reporting and monitoring, and evaluation; and (ii) a Project Implementation Team within MAFF, to be responsible for the day-to day implementation of the Project; and (b) at the provincial level, prior to the commencement of any Project activity in the respective province, establish, and thereafter maintain throughout Project implementation: (i) a Provincial Project Coordination Office to be responsible, inter alia, for overseeing the Project implementation, coordination of Project activities and preparing annual work plans and budgets and progress reports at provincial and district levels; and (ii) a Provincial Project Team to be responsible, inter alia, for providing technical assistance, including monitoring activities carried out by the service providers at the field level.

Annual Work Plans and Budgets Grant Agreement: Schedule 2, Section I.C Recurrent, Annual The Recipient shall prepare and furnish to the Bank for its no-objection not later than November 30 of each fiscal year of the Recipient during the implementation of the Project (or such later date as the Bank may agree), an Annual Work Plan and Budget ("AWPB") for the Project as approved by the MEF, containing relevant Project activities and expenditures proposed to be included in the Project in the following fiscal year, including a specification of the sources of financing for relevant expenditures, and environmental and social risk management measures taken or planned to be taken in accordance with the provisions of Section D of this Schedule.

Sub-grants Grant Agreement: Schedule 2, Section I.E Recurrent, Continuous For the implementation of Part 1.1 (a) of the Project, the Recipient shall provide Sub-grants to Producer Groups to carry out Sub-projects, in accordance with the selection and eligibility criteria and procedures and under terms and conditions acceptable to the Bank and set forth in the PIM.

Conditions

Type	Citation	Description	Financing Source
Effectiveness	Grant Agreement: Article IV	This Agreement shall not become effective until evidence satisfactory to the Bank has been furnished to the Bank that the Recipient has adopted the Project Implementation Manual in form and substance satisfactory to the Bank.	Trust Funds

I. STRATEGIC CONTEXT

A. Country Context

1. **Over the past two decades, sustained economic growth has driven Cambodia to lower middle-income status and significantly reduced poverty**. The economy grew at an average annual rate of 8.2 percent between 2000 and 2019, and over this period it was the fifth fastest-growing economy in the world. This growth was driven largely by tourism, manufacturing exports, real estate, and construction. However, agricultural sector continues to play an important role in Cambodia's economic and social development (contributing approximately 22 percent to the country's GDP) and provides a major source of employment and income, particularly for the rural poor. The country reached lower middle-income status in 2015. By 2019, the poverty rate had almost halved, from 33.8 percent in 2009 to 17.8 percent. Despite this progress, some 2.4 million people (15 percent of the population) are considered near-poor[1] and vulnerable to falling back into poverty when exposed to economic and other external shocks.

2. **The COVID-19 pandemic and associated global economic disruptions pushed Cambodia into its first recession in 25 years, with GDP contracting by 3.6 percent in 2020.** COVID-19 had a pronounced impact on Cambodia's economy as the three sectors that were most heavily affected—tourism, manufacturing (garment) exports, and construction—were the major drivers of Cambodia's growth immediately prior to the pandemic. The economic downturn from COVID-19 led to at least an additional 500,000 people being classified as poor in 2020, and price surges in 2022 further pressured household budgets, potentially raising poverty by another 4 percentage points from 2019/20 levels, excluding the pandemic's effects. Climate risks, such as floods and extreme heat, also threaten poverty reduction efforts, with the poorest communities being the most at risk. If unaddressed, climate change could increase poverty rate by up to six percentage points by 2040, with women and disadvantaged groups being particularly exposed. The pandemic also increased malnutrition, especially among marginalized groups. While the economy has gradually recovered, accelerating to 5.0 percent GDP growth in 2023, economic recovery is unlikely to return to the pre-pandemic growth levels of 8 percent. While farm employment steadily declined, accounting for 35.7 percent of total employment (2021), owing to Cambodia's structural transformation, rural livelihoods, where about 76 percent of people rely directly on agriculture and fishing, were particularly affected.

3. **Cambodia is increasingly vulnerable to climate hazards and environmental pressures.** Over the last three decades, Cambodia has faced 20 floods, 5 droughts, 6 tropical storms, and 1 famine, with at least US$1.5 billion of estimated damage.[2] The 2011 flood alone caused over US$200 million in agricultural losses. By the 2040s, a quarter of the population could be exposed to extreme flooding, and severe climate events could reduce GDP by 9.8 percent in the 2050s.[3] Between 2011 and 2021, forest loss jumped to 1.76 percent annually, up from 1 percent in 2001–2010, driven by pasture and cropland expansion and commercial logging. The country's GHG emissions have been rising, with the agriculture forest and other land use (AFOLU) sector accounting for roughly three-quarters of national GHG emissions.

4. **The Royal Government of Cambodia (RGC) aims to sustain pro-poor growth and foster greater competitiveness, resilience, and sustainable development.** For competitiveness, the government aims to improve the efficiency of producers and incentivize productivity in firms while addressing infrastructure gaps to support rural and urban connectivity in Cambodia. The RGC also aims to enhance the quality of human capital to meet the country's development needs and create a workforce that drives productivity growth. The RGC has also created several climate-smart

[1] Near-poor is defined as those whose daily per capita consumption lies between the poverty line and 1.25 times poverty line (Cambodia Socio-Economic Survey (2019/20), National Institute of Statistics, Ministry of Planning, Royal Government of Cambodia.
[2] Emergency-Events Database [EM-DAT], 2021.
[3] Cambodia CCDR, 2023.

development policies to address the country's significant climate risks.

B. Sectoral and Institutional Context

5. **Agriculture in Cambodia is undergoing structural change in terms of GDP contribution, and employment.** Agriculture's GDP contribution dropped from 36 percent in 2000 to 21 percent by 2019, and agricultural employment fell from 73 percent to 35 percent in the same period.[4] While Cambodia still has a higher share of agricultural jobs compared to regional peers, rural workers are increasingly moving to higher-productivity urban jobs in manufacturing and services. Smallholder farming households[5] have expanded livestock production, which now accounts for 11.7 percent of agricultural GDP, down from 26.5 percent in 2000. Livestock production has grown at 5.5 percent annually, driven by poultry and pigs, especially in Kampong Speu. Table 1 below shows the increasing livestock numbers in Cambodia.

Table 1: Evolution of livestock numbers between 2016 and 2023

`	2016	2017	2018	2019	2020	2021	2022	2023	% change per annum 2016-2023 (CAGR))
Cattle	2,920,314	2,971,722	2,928,534	2,779,762	3,272,401	3,399,957	3,474,451	3,486,413	2.2%
Pigs	2,970,624	3,074,283	2,747,855	2,185,924	2,516,679	3,018,797	3,431,062	3,584,003	2.4%
Poultry	35,733,761	36,244,939	38,166,751	40,395,453	48,062,169	53,422,704	58,154,987	59,351,383	6.5%

Source: GDAHP Annual Report, 2023 and author's calculation

6. **A growing population, increasing urbanization, and related rising incomes are driving changing dietary patterns, creating opportunities for smallholder livestock farmers to earn higher incomes**. Cambodia produces enough meat to meet 82 percent of the local, annual market demand, with the rest being covered by imports.[6] In 2022, Cambodia imported about 17,000 pigs and 5 million live chickens. The country could replace meat imports with local production and possibly export to neighboring countries, depending on improvements in efficiency and competitiveness in the livestock industry. Raising livestock offers higher returns and lower variable costs, making it a better income source. Growing domestic demand for livestock products presents an opportunity to enhance smallholder farmers' livelihoods.

7. **Livestock production is still characterized by low productivity, mainly due to inadequate use of advanced technologies and practices**. Livestock in Cambodia are raised in subsistence systems, with few commercial farms. Farmers rely on traditional means due to limited access to advanced knowledge, technologies, and good practices. High production costs, low access to quality breeding stock and feed, and low adoption of good animal husbandry practices (GAHPs) severely constrain productivity. Farmers also lack institutional support and advisory services that are crucial for adopting improved practices. The lack of a strong public agricultural extension service means that extension information and training insufficiently reach smallholder farmers.

8. **The agriculture and livestock sector in Cambodia is highly vulnerable to climate hazards but also contributes to greenhouse gas (GHG) emissions.** Climate change-related damage and losses in agriculture over the 2006–2019 period are estimated at US$1.18 billion, of which floods and droughts accounted for 64 percent and 35 percent, respectively.[7] The 2011 floods caused significant livestock losses, with two-thirds of households that owned livestock losing animals. Since the 1970s, agriculture's contribution to climate change has also been increasing. The main drivers of agricultural GHG emissions are rice cultivation (65 percent), followed by livestock emissions (24 percent). The expansion of agricultural land areas, including by overgrazing, has also significantly contributed to forest and biodiversity loss. Due to its low productivity, Cambodian livestock production is emission-intensive: 1 kilogram of beef emits 89 kilograms of carbon

[4] National Council for Sustainable Development (NCSD), 2019.
[5] Smallholder farming households commonly raise 2-9 heads of cattle, and 3-30 heads of small livestock.
[6] General Directorate of Animal Health and Production (GDAHP) Annual Report, 2022.
[7] Agriculture deep-dive note for the Cambodia CCDR.

dioxide equivalent (kg CO_2e), compared to 69 kg CO_2e in Thailand and 51 kg CO_2e in Vietnam. Increasing livestock numbers may significantly contribute to emissions.

9. **Since the 1990s, Cambodia has made strides in organizing farmers into producer groups (PGs)[8] to enhance cooperation.** PGs have been essential for strengthening collaboration between smallholder farmers and generating value for farmers through aggregation, enhanced processing, trade, bargaining power, and social capital. However, few Cambodian PGs are successfully active in agricultural trade and processing, despite the demonstrated benefit of well-functioning PGs.[9] In many cases, PGs are in debt, have gone bankrupt, and have lost members. Lack of working capital, poor management and leadership, limited business acumen, and the marginalization of women significantly hinder PGs' performance.

10. **Smallholder farmers struggle to gain market access and competitive prices for their produce**. Only about 10 percent of the country's agricultural production is processed, a relatively constant figure since the late 1990s,[10] due to low investment in agro-processing, resulting in poor post-production infrastructure. Most pigs and cattle are slaughtered traditionally at simple facilities with low capacities and poor sanitary standards due to a lack of more modern slaughterhouses. The growing private sector offers opportunities for public-private partnerships to improve smallholder access to infrastructure, markets, and competitive prices. However, partnership models like contract farming, which involve only 16 percent of PGs, remain limited in scope and face challenges. Strengthening PGs' capacity and their relationships is crucial to aligning needs, improving produce quality, and fostering mutual benefit.[11,12]

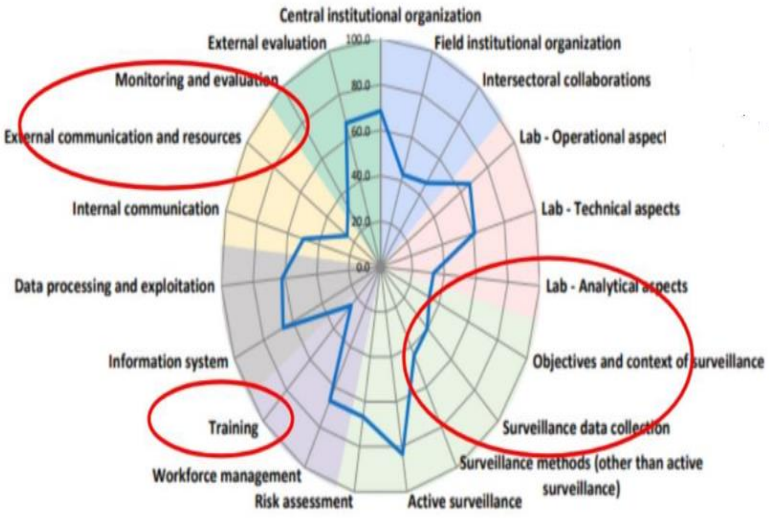


Figure 1. SWOT Analysis of Animal Disease Surveillance and Management System in Cambodia

11. **Inadequate control of animal diseases, zoonoses, and transboundary animal diseases (TADs) threatens livestock productivity and commercialization in Cambodia.** Recent outbreaks of foot and mouth disease, African swine fever, highly pathogenic avian influenza, and lumpy skin disease have caused major economic losses.[13] The country also faces food safety issues, antimicrobial resistance (AMR), and neglected zoonotic diseases, with climate change expected to increase risks. National and subnational veterinary services struggle with limited resources, insufficient training, and poor surveillance (Figure 1). At the same time, the over 9,000 village animal health workers (VAHWs), who deliver most field veterinary services, operate voluntarily, with limited incentives, leading to high turnover and inconsistent services.

[8] Producer Group means a group of producers established for a specific production, processing or marketing purpose, in accordance with the Recipient's legislation, and meeting the criteria set out in the PIM. Producer groups refer to producer organizations, including agriculture cooperatives and less formal organizations, which are considered equivalent in this project context.
[9] Assessment of the Agricultural Cooperatives for Developing Policy on Public, Private and Producer Partnership (PPPP) in Cambodia, Centre for Policy Studies, 2023.
[10] Agriculture deep-dive note for the Cambodia CCDR.
[11] Assessment of the Agricultural Cooperatives for Developing Policy on Public, Private and Producer Partnership (PPPP) in Cambodia. Centre for Policy Studies, 2023.
[12] Ibid.
[13] WB Report: Crossborder and Regional Collaboration to reduce one health risks in Cambodia and Laos.

C. Relevance to Higher Level Objectives

12. **The proposed project aligns well with the priorities of the World Bank's Systematic Country Diagnostic Update for Cambodia, approved on March 18, 2024, and Cambodia Country Partnership Framework (CPF) for the period FY25–29, which has been approved on October 16, 2024**. The project will support HLO 3's Objectives 6 and 7, which aim to strengthen poor household's resilience to shocks, focusing on enhancing social protection and livelihood opportunities; and to reduce exposure to environment degradation and climate change. The project promotes production technologies and animal health services to enhance livestock productivity and resilience while integrating smallholder farmers into commercial value chains, through adoption of climate-smart technologies to improve productivity, resilience, and climate mitigation.

13. **The proposed project aims to enhance the country's agriculture sector to be competitive, inclusive, and sustainable, as outlined in various strategies and plans**. The RGC's Pentagonal[14] Strategy prioritizes resilient, sustainable, and inclusive development. Under the Pentagonal Strategy's resilient, inclusive, and sustainable development pillar (Pentagon 4), the RGC identifies promoting agriculture and rural development and readiness for responding to climate change as key priorities. The Agriculture Development Policy 2022–2030 aims to modernize Cambodian agriculture for competitiveness, inclusivity, and climate resilience, with "inclusive and sustainable development" as a high priority. The proposed project will support the implementation of the RGC's "Strategic Planning Framework for Livestock Development," which identifies key issues and action plans for the subsector. The Ministry of Agriculture has determined that improving animal husbandry practices is key to achieving a sustainable food system.

14. **The project aligns with the country's medium- and long-term climate goals and the Cambodia Country Climate and Development Report** (**CCDR).** Cambodia's Nationally Determined Contribution (NDC) prioritizes mitigation actions to reduce 42 percent of emissions by 2030. The Long-Term Strategy for Carbon Neutrality (LTS4CN) targets net zero emissions by 2050 by reducing agricultural methane and surpassing current NDC goals. The plan aims to enhance agriculture's resilience and productivity by sharing climate-related information with farmers. The CCDR stresses the importance of reducing climate vulnerability through climate-smart agriculture (CSA). It highlights climate-smart livestock practices as key to improving production efficiency, productivity, and farmer incomes. The CCDR also emphasizes private sector engagement as essential for building resilience in agricultural value chains and funding value-added agro-industrial processing. On adaptation, Cambodia's Climate Change Strategic Plan 2014-2023 identify promoting climate resilience through improving food, water, and energy security as one of the strategies. The project aims to promote climate-smart technologies and disseminate climate information while supporting the inclusion of smallholder farmers in value chains.

15. **The project aims to support gender equality in agriculture for women.** Some 52.2 percent of the active agricultural population are women, with a higher representation of 63 percent among agricultural cooperatives. Women play a crucial role in supplying local markets with high-value produce but face several disadvantages compared to men, including lower mobility and less access to training, market information, and productive resources. To market their produce, women need timely, reliable, and accessible market information. Loan finance and credit are also essential so women smallholder farmers can pay for inputs. Evidence shows that climate change disproportionally impacts women due to underlying vulnerabilities, including limited knowledge and access to climate risk information and resources.[15] Women are generally not the primary recipients of extension services. In this context, the project will strive for gender equality in programming access and livestock production and marketing.

16. **The project aims to improve nutrition and increase income by providing more access to protein-rich livestock**

[14] The Seventh Legislative of the National Assembly, August 2023.
[15] Empowering Women for Climate Resilience in Cambodia, World Bank 2024.

and connecting smallholder farmers to markets. The project will encourage the production of safe, high-quality, and nutritious livestock products to support healthy diets. It will enhance value chains that will increase access to protein-rich animal products. While poor farmers in Cambodia have better access to vegetables than meat, boosting beef production will allow them to retain more beef for home consumption. By integrating smallholder livestock producers into markets and enhancing productivity, the project will support the purchasing of diverse foods.

17. **Maximizing Finance for Development (MFD). The project contributes the World Bank MFD-enabling (MFD-e) approach and private investment generated through the project is private capital mobilized (PCM).** Component 1 is verified as both MFD-e and PCM. The MFD approach for project design and implementation will crowd in private sector investments to speed up livestock value chain development. For example, subcomponent 1.1. builds capacity of PGs for climate smart production and commercialization by financing *Climate-smart technology and practice packages (PaTecs)* and providing PGs Technical Assistance (TA) like financial literacy and linkage to financial service providers. Subcomponent 1.2 builds business partnerships among farmers, producer organizations, and agribusinesses through contract farming and alliances and improves common post-harvest infrastructure like market facilities to increase trade of livestock and livestock products. In total Component 1 generates US$2.175 million in PCM from grant co-financing contributions. An estimated US$1.65 million in subcomponent 1 from an expected 10,000 farmers contributing 40 percent of the US$700 investment in PaTecs in cash (60 percent) or kind (40 percent) and US$525,000 in subcomponent 2 from Private Sector Operator (PSO) contribution of US$105,000 per annum to maintain each of the 14 targeted slaughterhouses (US$7,500 per annum per slaughterhouse) during the approximately 5 years of implementation during the project period.

18. **The project will incorporate stakeholder feedback and establish a grievance redress mechanism as part of its regular monitoring activities**. The proposed project has incorporated relevant feedback from close consultations with direct beneficiaries and other stakeholders. A systematic feedback mechanism will be part of the regular project monitoring activities to strengthen citizen engagement further, and a grievance redress mechanism will be established and made known to all stakeholders. These will complement and enhance more traditional forms of monitoring.

II. PROJECT DESCRIPTION

A. Project Development Objective

19. **Project Development Objective** (**PDO) Statement.** The PDO is to sustainably improve livestock-based livelihoods and strengthen animal health services in target project locations.

20. **PDO-Level Indicators.** The achievement of the PDO will be measured through the following indicators: (i) percentage increase in volume of gross sales of livestock and livestock products; (ii) number of farmers adopting climate-smart or sustainable livestock technologies or practices; and (iii) percentage of farmers satisfied with animal health services provided in the project target areas.

B. Project Components

21. **The Project is designed to address three critical constraints to improved livelihoods of small livestock keepers in Cambodia**. The constraints are (i) low productivity, (ii) low incomes, and (iii) loss of livelihood from animal diseases and climate hazards. The project addresses these constraints by boosting small producers' adoption of climate-smart technologies to improve productivity, resilience, and climate mitigation. It will also enhance commercialization through better market access, value chain infrastructure, and stronger PGs. Finally, it will protect productivity gains by reducing disease risks and improving animal health services.

22. **The project is anchored in PGs**. For PDO achievement, project interventions will rely strongly on PGs as the primary unit for intervention. PGs, formal cooperatives, and other organized farmer groups will be the main entry points for reaching farmers with climate-smart technologies, ensuring adoption at scale, and delivering animal health and extension services. PGs will also be the primary source of aggregation and scale for small producers to increase commercialization and bargaining power for mutually beneficial business relationships with agribusinesses. Figures A1.2 and A1.3 (Annex 1) represents the main activities in which PGs engage, the services delivered to them, and relationships established to access markets. The Ministry of Agriculture, Forestry and Fisheries (MAFF) maintains provincial lists of PGs, including their current and planned activities. The project components are described below.

Component 1: Promote Inclusive and Sustainable Livestock Value Chains (approx. US$12.19 million).

23. **This component aims to sustainably improve the productivity of livestock production and orient farmers toward more commercialization.** Such improvement will be done by promoting productivity-enhancing technology and practices, which also build resilience and reduce GHG emissions, and by fostering market-driven commercialization approaches in selected livestock value chains. The activities under this component will contribute to increased returns to producers while enhancing resilience to climate shocks and reducing the GHG emission intensity of livestock production. The component will finance; (i) access to climate-smart technologies and practices, (ii) TA to improve the organization of farmers and strengthen the operation of producer groups, (iii) the rehabilitation and upgrade of value chain infrastructures, and (iv) facilitation of the linkage between PGs and agribusinesses.

24. **Following comprehensive outreach activities to broaden awareness about the Cambodia Inclusive Livestock Value Chains Project (CILVCP), a detailed capacity assessment will determine the eligibility of groups for project support**. The project will directly support at least 100 existing PGs[16] and reach 30,000 people with capacity-building activities, including awareness raising, training, and marketing support.

Subcomponent 1.1: Enhancement of Livestock Productivity (US$8.80 million).

25. **Activities under this subcomponent will focus on improving livestock productivity and output volume while enhancing climate resilience and reducing the emission intensity of livestock production.** The project will finance the following:

(a) ***PaTecs*** which include improved breed, feed, and fodder production, rangeland management, GAHPs, manure management, and crop-livestock integration to increase productivity, build resilience of livestock, and reduce livestock GHG emissions intensity.
(b) ***Strengthening PGs***. The project will support the capacity building of producer organizations for climate-smart production and commercialization.

26. The project will support improved farmer access to four groups of PaTecs, which will include:

(a) ***Breeding.*** Breeding services will be provided to improve animal stock so that animals have higher productivity and greater resilience to disease. The project will support access to modern inputs of high-yielding breeds. The project will support access to semen for artificial insemination, hatcheries, and piglets via producer organizations.
(b) ***High-quality feed and fodder an improved pasture management***. Farmers will produce better-quality fodder and formulated feed to address the low levels of nutrition and reduce methane emissions from the growing

[16] For further information on the PGs, refer to the PIM.

herds of livestock. The project will finance backyard feed and fodder production and pasture management. Farmers will be trained in domestic feed and fodder production using local materials and improved pasture management techniques. They will be supplied with improved seeds and encouraged to grow grasses and legumes of better digestibility for higher productivity and lower emissions.

(c) ***Good animal husbandry practices (GAHPs).*** The project will promote GAHPs compliant with ASEAN standards, especially investment in improved shelter/facilities, incorporating sustainable building design standards, and biosecurity, sanitation, and hygiene measures to prevent the introduction and transmission of animal diseases and improve animal welfare and product quality and safety. A set of GAHPs will be codified, promoted, and certified.

(d) ***Animal waste management.*** Animal waste management technologies and practices will be rolled out to ensure that waste is sustainably managed and methane emissions from manure are minimized, e.g., composting and waste treatment. Waste will be recycled and used for manure on crop farms.

27. **The investments in PaTecs will be financed through a grant co-financing to farmers via PGs.** Grants will be provided to farmers through PGs based on the submission, review, and approval of simplified Livestock Business Plans (LBPls), by an evaluation and endorsement committee/team nominated and supervised by the project team and chaired by MAFF. The project will provide grant co-financing of up to 60 percent, while households/beneficiaries provide a minimum of 40 percent contribution in cash or through contributing family labor or other required assets to enhance livestock productivity. Grant management and administration is included in the PIM. LBPls will be co-financed if farmers take up at least one technology/practice from one of the four PaTecs groups. Annex 1 summarizes the prospective PaTecs per value chain. It is foreseen that 10,000 livestock keepers will benefit from grant co-financing, not exceeding US$700 per household/beneficiary.[17]

28. **The project will support already-existing PGs with sufficient capacity. PGs will be supported to augment the number** of members, carry out livestock production planning, and commercialize. The project will provide TA for strengthening existing livestock-based PGs to mobilize members and enhance capacities for climate-smart production, collective action, and business orientation through the support of a technical service provider (TSP) – firm or NGO or individual consultants. The TA will provide support to PGs to develop simplified LBPls and will provide mentoring and capacity development for (i) implementation of climate-smart technologies, (ii) strengthening of leadership, governance, and managerial capacity (efforts will be made to include more women in leadership and management positions), (iii) technical skills in entrepreneurship and livestock production planning and development, (iv) financial literacy and linkage to financial service providers, (v) negotiation, and (vi) networking with potential off-takers.

Subcomponent 1.2: Promoting Smallholder Market Access (US$3.39 million).

29. **Activities under this subcomponent will focus on improving the commercialization of smallholder farmers through enhanced access to markets, aiming to increase livestock product sales and farmer incomes.** To achieve this, the project will finance (i) the establishment/strengthening of ***business partnerships*** between smallholder farmers and agribusiness to unleash market opportunities for smallholder livestock producers and (ii) ***the improvement of common post-harvest infrastructure*** such as slaughterhouses and market facilities to increase quality, aggregation, processing, and trade of livestock and livestock products of farmers and agribusinesses.

30. **The project will provide TA to smallholder farmers to foster improved participation in value chains through**

[17] To ensure consistency and simplicity in this PAD and other project documents, the term "LBPl" is used both for PG and Private Sector Operator (PSO) although their business plan templates, eligibility, and selection criteria are not identical due to the nature of business operations at different stage in the livestock value chain.

establishing and strengthening/expanding available business partnerships between smallholders, traders, and small, medium, and large agribusinesses. The project will (i) conduct commodity market studies to enhance understanding of agriculture value chains, informing PG operations, regulations, and market incentives for sustainable partnerships, and (ii) facilitate multi-stakeholder engagement opportunities and exposure visits to connect producers with market actors, fostering business opportunities, partnerships, and issue resolution.

31. **The project will fund upgrades to important value chain infrastructure, such as slaughterhouses and marketplaces, to boost access for smallholder farmers and enhance product quality.** The project will fund the upgrading of value chain infrastructure,[18] which is largely publicly owned but privately operated. Infrastructure upgrades will be based on simplified LBPIs or MOUs co-developed by PGs, traders, and private sector operators. MAFF will ensure that strategic value chain infrastructure is selected, including reviews of regulations, business models, and fee structures. The project will upgrade up to 20 slaughterhouses and public markets, with the General Directorate of Animal Health and Production (GDAHP) procuring goods based on approved LBPIs. The investment in slaughterhouses will be financed via GDAHP and will not exceed US$150,000 per slaughterhouse. The PSO will be expected to contribute a proportion of fee collection by slaughterhouses for maintenance purposes. The PSO will also contribute in the form of land, physical infrastructure, and other relevant investment costs within the slaughterhouse. Investment in public markets will not exceed US$100,000 per market. A sustainable business model is a prerequisite. Upgrades will comply with acceptable standards for climate resilience and energy efficiency and follow GAHP, good manufacturing practices (GMP), and Hazard Analysis and Critical Control Point (HACCP) standards to minimize climate and public health risks. GDAHP will establish standard procedures and certification for upgraded facilities. Detailed information on eligible criteria, selection process, fund flow and evaluation criteria for slaughterhouse is outlined in the PIM.

Component 2: Enhance Animal Production and Health Services (approx. US$5.48 million).

32. **This component seeks to strengthen national and subnational extension and animal health services.** Strengthening the core capacities of national and subnational institutions will allow them to deliver effective and consistent extension and animal health services, and to manage animal diseases and zoonoses. By doing so, the activity will increase or preserve livestock herd productivity and farmer incomes by limiting losses from the growing burden of animal diseases and climate hazards thanks to improved climate-smart information and animal health. Ultimately, the activities will enhance the resilience of livestock-based livelihoods. The project will finance (i) demonstration farms to showcase PaTecs, (ii) TA for the development and dissemination of extension information through an information, education, and communication (IEC) approach, (iii) a capacity-building program for national, provincial, and grassroots-level animal health service providers (GDAHP, Provincial Offices of Animal Health and Production (POAHPs), VAHWs, etc.), and (iv) establishment of an enhanced local disease surveillance system. Training activities around animal production and health services may also be available for participants from other provinces than the core project provinces.

Subcomponent 2.1: Strengthening Capacity in Animal Production Service Delivery (US$1.16 million).

33. **Activities under this subcomponent will focus on improving farmers' access to extension information and training by enhancing national capacities to deliver and coordinate extension services.** The project will finance two main extension approaches to achieve this: (i) **field demonstrations and training** to equip farmers with practical skills and encourage them to adopt PaTecs most suitable for them, and (ii) **IEC**, using various actors and media, including information and communication technologies (ICTs), to provide easy access to information and training materials for production and post-production.

[18] Slaughterhouses are operated by private sector players through a long-term lease agreement (up to 20 years) with the government, based on a bidding process. Leases are renewable.

34. **The project will finance the development and delivery of livestock extension services through demonstration farms, developing and delivering IEC materials and training to farmers via PGs, and other means of outreach.** The project will strengthen the capacity of available public extension institutions – extension workers, MAFF, GDHAP, and POAHP officers, VAHWs, and the cadre of commune agriculture officers (CAOs) - which the government is recruiting to increase farmers' knowledge and skills in areas of animal production, animal health, PaTecs, and post-harvest management, processing, and marketing.

35. **MAFF and GDAHP will support the establishment of demonstration farms to provide interactive onsite learning. Doing so will improve farmer knowledge and skills on climate-smart livestock production, build farmers' capacity, and encourage them to adopt PaTecs.** Demonstrations will be established in the fields and homes of selected 'lead' farmers. Lead farmers – high-performing, well-respected members of reputable PGs – will be identified and supported by the project to act as champions for adopting new technologies/practices and promoting more efficient, resilient, and low-carbon production. Supported by MAFF and GDAHP, lead farmers will regularly hold open days and community education sessions for other farmers in their area. It is envisaged that a total of 45 demonstration farms will be established (about 15 per province), with each demonstration farm located strategically to serve an average of 200 households or at least two PGs.

36. **Public extension service workers are scarce in Cambodia. As such, the project will train farmers and leverage ICTs to support the wider dissemination of information.** The project will use proven ICTs to facilitate the adoption of climate-resilient practices and technologies and various media technologies to facilitate access to advisory services such as mobile phones, radio, and web-based platforms to form a digital extension system. Doing so will significantly increase the number of farmers reached beyond the directly supported PGs.

37. **MAFF and GDAHP will contract a technical service provider (TSP) in project sites, such as a local NGO or firm, to support the development of a digital extension system**. The TSP will aim to enhance the capacity of provincial-level MAFF and GDAHP staff, as well as agricultural extension workers, to implement and maintain the system effectively. Figure A1.4 (Annex 1) summarizes the institutions involved in extension service. A central-level coordination unit consisting of extension specialists under MAFF and GDAHP will develop and manage an extension implementation plan, develop extension materials, and deliver commodity-specific training modules to farmers through PGs and training provided to commune agriculture officers (CAOs) and VAHWs. The project will initiate extension service provision with conservative targets in Year 1 to allow for testing of the process. After that, a rapid evaluation and finetuning will inform scaling up in subsequent years to reach at least 20,000 farmer households (HHs).

Subcomponent 2.2: Strengthening animal health service delivery capacity (US$4.32 million).

38. **Under this subcomponent, the project will focus on improving the capacities of national and subnational institutions to deliver animal health services and to perform disease surveillance and management in project locations.** The project would finance (i) strengthening **capacities of national and local institutions** like MAFF, GDAHP, POAHPs, CAOs, and VAHWs to deliver veterinary services through bolstering the workforce, skills, and incentives for last-mile service providers, and (ii) the strengthening of disease **surveillance and response capacities** for prevalent TADs and zoonoses in project locations, through an enhanced local surveillance system.

39. **The project will support MAFF and GDAHP in developing and implementing a capacity-building program for veterinary personnel and building capacity in local VAHWs.** It will provide TA to GDAHP and the zoonotic technical working group (Z-TWG) for capacity assessments and development of key strategies for animal health, veterinary services, and zoonoses management. These strategies would include disease surveillance plans and standard operating procedures. The project will focus on continuous professional development in areas such as disease risk analysis, food safety, GAHP,

and climate-smart livestock communication. It would also expand the Cambodian Applied Veterinary Epidemiology Training (CAVET) program and pilot a program to attract young professionals for delivery of rural animal health services. Additionally, the project will implement a capacity-building program for local VAHWs, offering refresher courses, expanding their numbers, and providing specialized training in epidemiology, disease risk assessment, AMR, food safety, and data management, so they can effectively provide last mile animal health services, disease surveillance and awareness raising. VAHWs will receive business start-up kits, such as artificial insemination kits and pharmaceuticals, as incentives to develop sustainable businesses, with up to 700 VAHWs trained and 350 kits worth up to US$1,000 provided to select VAHWs based on performance and contribution. GDAHP will oversee kit procurement and distribution.

40. **The project will pilot an enhanced local disease surveillance system for early detection, early warning, and response in the project's three provinces for key diseases (foot and mouth disease, avian influenza, and African swine fever), AMR, and zoonoses.** In four main identified areas of weakness, the project will improve on the existing surveillance system by financing: (i) an epidemiological mapping exercise to identify past and present disease cases and hot spots of disease occurrence, (ii) an ICT-based local data collection and sharing platform to gather and communicate disease risks frequently, (iii) regular epidemiological surveys and surveillance activities on farms, market, and slaughterhouses, and (iv) cold chain and biosecurity equipment to ensure safe and effective collection, transport, and storage of samples. GDAHP will manage the surveillance system through the surveillance task force and incorporate other ministries as needed, e.g., Ministry of Health and Ministry of Environment through Z-TWG. The surveillance system will use VAHWs to enhance grassroots preparedness, detection, and early response to emerging infectious diseases and zoonoses. This subcomponent's project activities will help establish One Health coordination and planning in Cambodia and the three target provinces, utilizing local ICT-based data collection and sharing platforms to provide input to the national Animal Health and Production Information System (AHPIS) project financed by the Asian Development Bank (ADB).[19]

Component 3: Project Management, Monitoring, Evaluation, and Learning (approx. US$2.33 million)

41. **This component will finance operating costs, consultants, and training to carry out fiduciary, environmental, and social safeguards activities and report on the project's implementation progress and results.** Particular attention will be paid to monitoring/evaluation and learning. The project will support developing and maintaining a management information system for results tracking and reporting. The project will support establishing a robust monitoring system to track project activities and measure impacts on productivity, value addition, and animal disease and zoonoses. The project will also integrate data collection to track the project's contribution to reducing GHG emission intensities of livestock as part of the monitoring system. The project will implement surveys to ensure systematic assessments of implementation experience and lessons learned. Qualitative assessments will also generate knowledge during implementation to make mid-course corrections. This component will finance mid-term review, final evaluation reports, and underlying analytical work. A consultant will lead the preparation of the mid-term review report in Year 3 of project implementation; an independent institution will carry out the final evaluation report.

C. Project Beneficiaries

42. The project will cover Battambang, Tbong Khmum, and Kampong Speu provinces, chosen for their high-risk status—Battambang and Tbong Khmum for their cross-border entry points where TADs first appeared, and Kampong Speu for its high livestock density and animal trade. Around 30,000 direct beneficiaries will include farmers, staff of GDAHP, POAHP, MoH, MoE, VAHWs, CAOs, traders, and agribusinesses, with 40 percent being female. The project will focus on high-potential smallholder farmers and work with existing PGs interested in expanding their livestock businesses, with support provided mainly through PGs. Approximately 20,000 farmers will benefit from training, grant co-financing for climate-

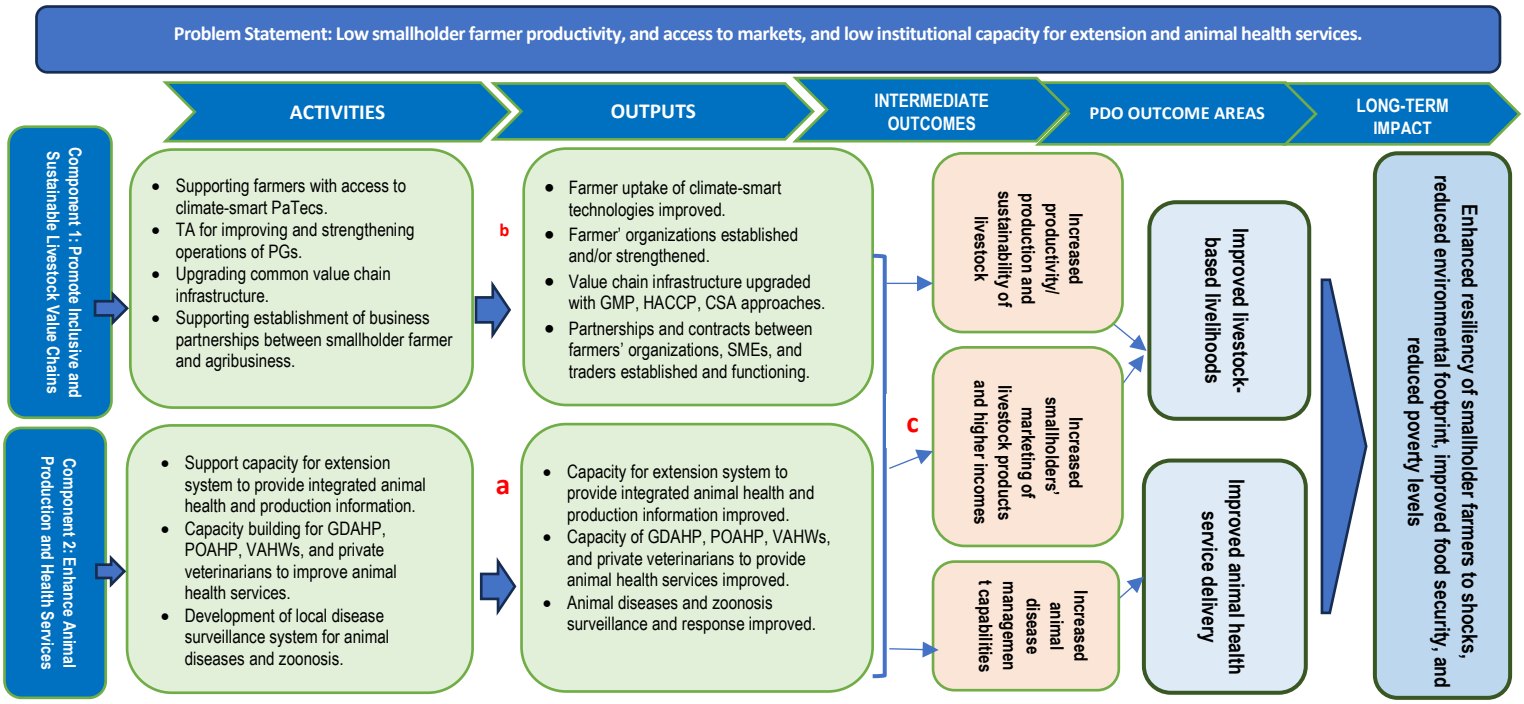
[19] ADB's Cambodia: Greater Mekong Subregion Cross-Border Livestock Health and Value Chains Improvement Project is being implemented in Kampong Cham, Odor Meanchey, Prey Veng, Phnom Penh, Siem Reap, and Takeo provinces, along with some national level systems and activities.

smart technologies, and access to improved infrastructure, veterinary, and extension services. The remaining 10,000 beneficiaries will include farming households, agribusinesses, and traders. SMEs collaborating with farmers and PGs will also receive support. The project will use transparent, participatory processes for beneficiary selection and will upgrade value chain infrastructure, such as slaughterhouses and markets, to meet higher safety and quality standards. Women will be a key focus, with efforts to enhance their livestock production skills, access to technology, and involvement in producer organization management.

D. Results Chain

43. **The results chain to the theory of change presented in Figure 2 illustrates the critical investments required to achieve the PDO.** The project addresses the challenges that persist among small scale livestock producers in Cambodia, which affect their livelihood as expressed through incomes, and food and nutrition security. Firstly, the project will enhance productivity through improving climate smart technology/practice access and uptake. Secondly, the project will reduce risk to sustainable livestock-based livelihoods from climate hazards, and animal diseases and zoonoses. Thirdly, government capacity in animal health and extension service provision will be improved. Fourth, farmers will be better organized through improved producer organization and included more in commercial value chains. Fifth, livestock products will have lower GHG emission intensities.

Figure 2. Results Chain of Theory of Change



Critical assumption: (a) Government will support participation in capacity building, (b) modern technologies will be adopted and maintained (c) Market prices of livestock products will be stable.

E. Rationale for Bank Involvement and Role of Partners

44. **The cost of the proposed project is US$20 million, wholly funded by the Global Agriculture and Food Security Program (GAFSP).** The RGC asked the Bank for help submitting a proposal to GAFSP. The proposal would assist smallholder livestock farmers affected by COVID-19 with interventions to improve production and resilience to climate and disease risks while also reducing GHG emissions and improving food security in the medium term.

45. **The project will coordinate with the RGC and other development partners to improve the overall effectiveness of the investments, reduce costs, and avoid unnecessary duplication of work.** Key projects that will be coordinated include the ADB-managed 'Cambodia: Greater Mekong Subregion Cross-Border Livestock Health and Value Chains Improvement Project', which is being implemented in Kampong Cham, Oddor Meanchey, Prey Veng, Phnom Penh, Siem Reap, and Takeo provinces, the related Pandemic Fund project, and the Kreditanstalt für Wiederaufbau (KfW) project on animal health and One Health.

46. **The project builds on past projects and leverages ongoing and planned projects to improve livestock productivity and health in Cambodia**. The project builds on the successful completion of the World-Bank-financed Avian and Human Influenza Control and Preparedness Emergency Project (AHICPEP). The project takes forward the concept of ***"healthy livestock, healthy village and better life"*** by promoting animal welfare activities through GAHP. It also promotes disease prevention and control measures by providing animal health services and disease surveillance at village level via PGs. The project complements other livestock projects, and the Bank is well-positioned to support MAFF in improving animal disease management and One Health.

F. Lessons Learned and Reflected in the Project Design

47. **The project builds on many lessons learned from existing and past projects implemented by the Bank,** i.e., AHICPEP, the Land Allocation for Social and Economic Development (LASED) project, Cambodia Agricultural Sector Diversification Project (CASDP). It also builds on the lessons learned by development partners such as the International Fund for Agricultural Development (IFAD), United States Agency for International Development (USAID), ADB and Asian Infrastructure Investment Bank. These include alignment with national policies and systems contributing to strong local ownership and impactful outcomes. The key lessons generated and considered in the project design include:

(a) Aggregation of ***livestock smallholder farmers*** supports collective access to formal, better-remunerated markets and farm-level field schools and co-investment. Such aggregation is instrumental to disseminating broad adoption of innovation, including through formal co-investment fund or grants (*ASPIRE Programme funded by IFAD*).

(b) The ***adoption rates of climate-smart livestock*** technologies/practices vary considerably. A recent study showed adoption rates in Ethiopia as follows: composting (85 percent) and manure management (70 percent), bio-gas generation (4 percent), destocking (64 percent), improved breed (60 percent), fodder (29 percent), and rotation grazing (22 percent).[20] Adoption rates for women tend to be lower than for men.

(c) When the government works closely with the private sector/traders, producers, and experts in their respective fields, this can ***strengthen animal health*** and ***food safety surveillance*** to reduce zoonotic disease outbreaks (*Improved Sanitary and Phytosanitary Handling in Greater Mekong Subregion Trade Project, funded by ADB*).

(d) It is critically important for the country to build the ***capacity*** to address the ***root causes of animal disease*** outbreaks rather than only responding to active cases with emergency responses, i.e., case detection and culling. Therefore, other surveillance approaches (e.g., passive) should be used (*the AHICPEP*).

(e) Promoting ***dialogue*** between the private and public sectors and PGs and addressing low engagement capacities is important to improve the formation of business partnerships based on trust and cooperation (*CASDP, funded by the World Bank,* and *Micro, Small, and Medium Projects, funded by USAID*). However, facilitating partnerships requires a set of soft skills that may not be readily available at the level of provincial agricultural departments. It is recommended that other modalities, such as working with TSPs, NGOs, or

[20] Ayal, D. Y., & Mamo, B. (2024). Farmer's climate smart livestock production adoption and determinant factors in Hidebu Abote District, Central Ethiopia. Scientific Reports, 14(1), 10027.

management companies, be considered (*Vietnam Agriculture Competitiveness Project, funded by World Bank*).

(f) VAHWs deployed on the ground effectively disseminate and adapt ***technologies/practices*** and ***tools*** to support smallholder farmers in implementing resilient livestock business enterprises (*funded by HEIFER Cambodia*). However, there is a need to improve the effectiveness of extension services and technical training for smallholder farmers in Cambodia (*LASED, funded by the World Bank*).

(g) The lead farmer approach, where ***"champion"*** farmers act as market intelligence and technical focal points to demonstrate effective economic and technological innovation for smallholders, has been highly successful in Cambodia (*Accelerating Inclusive Markets for Smallholders (AIMS) project, funded by IFAD*).

(h) The establishment of ***business forums and networks*** among producers and private sectors, coupled with extension support led by private sectors at the provincial and communal levels, helps smallholders to improve their access to artificial insemination, better inputs, markets, and food safety. This strategy enhances their competitiveness and resilience.

(i) Reducing on-farm ***emissions intensity*** will not necessarily translate into lower absolute emissions, as these depend on total production and responses to wider market and policy signals. Nonetheless, focusing on the intensity of on-farm emissions presents a realistic approach to reducing supply-side emissions without precluding other actions to manage the demand for livestock products.[21]

48. **These lessons have been drawn to integrate with all the strategic interventions to be designed and deployed by CILVCP**, and it is anticipated that synergies will be established between and among projects in the fields for the Bank and development partner projects, both ongoing and those planned.

III. IMPLEMENTATION ARRANGEMENTS

A. Institutional and Implementation Arrangements

49. **MAFF will lead project implementation as the implementing agency via the GDAHP and related technical departments at the national level, alongside the Provincial Department of Agriculture Forestry and Fisheries (PDAFF) and POAHP.** The implementing agency (IA) has established a project management team (PMT), which is led by a Project Director and includes a deputy director, relevant technical experts, administration, procurement, finance, environmental and social standard (ESS), and M&E experts from relevant units of GDAHP and MAFF. The PMT will be responsible for the overall management of project implementation and external communication, including the agreed reporting to the World Bank. The PMT will be physically located in MAFF. The project implementation team (PIT) has been established to support the planning and execution of daily activities. During implementation, the IA, through the PIT, will draw on technical expertise and advice from broader MAFF departments and relevant ministries like the MoE and MoH to implement zoonotic-related activities. The PIT will be supported by relevant consultants and/or contract staff to bolster implementation capacity. A provincial project coordinating office (PPCO) will lead implementation in each province, drawing technical expertise from PDAFF and POAHP. Last-mile services at the communal level will be provided to farmers largely through PGs through POAHP, CAOs, and VAHWs. Private sector players will be the primary providers of inputs, technologies, and supplies. Figure A1.1 in Annex 1 summarizes the organizational structure for project implementation. Details of roles, responsibilities, and procedures are detailed in the PIM and Annex 1.

B. Results Monitoring and Evaluation Arrangements

[21] Livestock Research Group (LRG) of the Global Research Alliance on Agricultural Greenhouse Gases (GRA) and Sustainable Agriculture Initiative (SAI) Platform (2014). Reducing Greenhouse Gas Emissions from Livestock: Best Practice and Emerging Options.

50. **Results Framework and Monitoring (RFM).** A comprehensive RFM, including targets and definitions, has been prepared. The RFM is based on the Theory of Change (ToC) and describes the PDO-level and component-specific intermediate-level indicators. MAFF and GDAHP, through the PIT, will manage the M&E function, monitoring implementation progress and progress toward achieving the PDO for the respective component. The PIT will coordinate the preparation of an M&E manual, data collection, scheduling activities and budgets allocated to M&E, and producing required project progress reports. At the time of the mid-term review, the project will reassess the specific target values for the PDO indicators and outcomes of related intermediate results indicators based on progress made at that time.

51. **Project M&E Arrangements**. A results-based M&E system will monitor the project's progress using the following tools: (i) a results framework derived from clearly identified goals, objectives, outputs, and activities with corresponding indicators, means of verification, and key assumptions; (ii) a well-defined M&E strategy outlining information requirements, tools, and methodologies for data collection, analysis, and reporting; (iii) a comprehensive M&E plan with clearly defined roles and responsibilities for data gathering and reporting; and (iv) periodic internal and external assessments and evaluations, including baseline studies, beneficiary assessments, mid-term evaluations, ex-post evaluations, and impact evaluations.

C. Sustainability

52. **Project sustainability.** Three identified key sustainability risks – institutional, financial, and behavioral risks – will need to be managed through the project design, to achieve effective implementation and sustainability of the project activities and impact:

(a) **Institutional.** The project will strengthen key national and subnational institutions supporting animal production and health, including extension services, veterinary services, and local institutions like VAHWs, CAOs, and PGs. VAHWs will receive business start-up kits to sustain their services, while a TSP will assist PGs with mobilization, governance, business development, and financial management to ensure their sustainability. All public and private entities managing livestock value chain infrastructure must demonstrate a viable business model to qualify for project support, ensuring continuity beyond the grant co-financing.
(b) **Financial.** The project will use a co-financing approach to promote the uptake of PaTecs by farmers through PGs. Farmers will stake their own partial funding, i.e., 40 percent of the total cost of PaTecs.
(c) **Behavioral.** Given the strong evidence that belief systems influence the adoption of new technologies and practices, all project activities will include knowledge-sharing and training to drive behavioral change. This is essential for ensuring farmers adopt and sustain new technologies. The project will encourage farmers and other beneficiaries to engage in sustainable production and commercial enterprise, aiming for outcomes like reduced GHG intensity in livestock production.

IV. PROJECT APPRAISAL SUMMARY

A. Technical, Economic, and Financial Analysis

Technical Analysis

53. **The expected development impacts include increased incomes for targeted farmers and agribusinesses, an enhanced capacity to mitigate risks against climate change and animal diseases, and reduced GHG emissions intensity of livestock production.** The project will allocate 60 percent of funding to support smallholder farmers and SMEs, with a focus on enhancing productivity and resilience, mitigating GHGs, developing sustainable producer organizations, and improving products through modernized slaughterhouses and attention to food safety. Planned investments will improve

animal health and reduce disease risks through TA, training, and studies/surveys to enhance the capacities of relevant public institutions.

54. **The project primarily upgrades the public service provision in the livestock and associated sectors.** It will contribute to the effective delivery of core public services, such as information provision, the extension service for the livestock sector, and disease surveillance and control. Furthermore, strengthening animal health services and capacities is paramount to One Health and the prevention of transmission of diseases to humans in Cambodia. Thus, globally, it contributes to the public good.

55. **Paris-aligned livestock practices and risk assessment will cut emissions while improving efficiency and productivity.** The project is expected to contribute to a substantially reduced emission intensity of the livestock sector in Cambodia through activities that enhance efficiency of livestock production. Activities related to climate smart practices and provision of technical extension services under sub-components 1.1 and 2.1 are universally aligned, as they promote climate-smart animal husbandry practices, such as improved breeds, improved fodder, and improved pasture management practices, which meet the climate smart agriculture (CSA) criteria on mitigation, productivity, and resilience. Activities related to capacity building and training to support strengthening of PGs, local, national, and regional institutional capacities, and surveillance and diagnostic capacity are also universally aligned. Mitigation risks from activities that support equipment and infrastructure, including (i) grant co-financing to provide access to equipment and machinery for post-harvest management equipment and facilities, (ii) upgrading of key value chain infrastructure, and (iii) acquisition of cold chain equipment are considered to be reduced to low, given that these facilities are fully electrified and grid-connected, and will use feasible, energy efficient and lower GHG emissions alternatives in the design, such as renewable energy. Carbon lock-in and transitions risks are considered as low as these facilities do not prevent the adoption of low GHG emission alternatives as they become feasible during the facilities' lifetime. Activities related to the development of output-based contract arrangements between farmers and agribusinesses support improved efficiency in production and are low risk as these contracts will include measures that are conditioned on eligibility criteria that are geared towards ensuring climate smart value chain e.g. energy efficiency, GAHP, and Good Manufacturing Practice (GMP).

56. **Assessment and Reduction of Adaptation Risks.** Livestock production is highly vulnerable to rising temperatures, erratic precipitation and increasing extreme events, which can have direct impacts by affecting the health and productivity of farm animals and indirect impacts through effects on grassland, species distribution and diseases. Extreme temperatures and other extreme climatic events such as droughts and floods are likely to negatively influence the livestock sector in Cambodia, as will the climate-related increase in animal diseases. The inherent level of risk is moderate-substantial. The project aims to reduce these risks and the vulnerability of Cambodia's livestock sector through various interventions. These interventions include (i) capacity building activities to strengthen producer organizations which will contribute to enhanced resilience through their increased capacity to support herders to employ resilient livestock production practices, (ii) measures to improve animal health services, which will result from various activities under component 2, which will enhance the resilience of livestock against climate-related animal diseases, and (iii) improved access to extension services, which will support climate information exchange and build farmers' skills for climate-smart technology/practice implementation. Combined, these measures will enhance the resilience of the livestock sector overall, hence mitigating the impact of the above-mentioned climate risks. Furthermore, infrastructure investments will incorporate climate resilient designs, such as improved ventilation, and drainage to reduce risks from climate hazards. Residual risk after these interventions is judged to be low. Thus, risks from climate hazards are reduced to an acceptable level, ensuring that risks don't undermine the effectiveness of the project and pose a threat to achieving the development objective.

Bank Value Added

57. **The Bank will use its experience in Cambodia to support the project's planning and implementation.** The Bank's regional experiences with livestock and animal health will be an important asset to help shape the project and build on good practices. The Bank will leverage synergies with ongoing Bank-supported projects that cover livestock or human health.

Economic and Financial Analyses

58. **Economic Analysis.** The project's main economic benefits will come from four sources: (i) adoption of PaTecs to increase the size of stocks and improve beneficiary farmers' productivity through measures including breeding, improved feed, GAHPs, and animal waste management; (ii) reduced disease-related losses in project areas; (iii) integration of forage production to enhance crop-livestock systems; and (iv) better post-production management, value addition, and marketing. These efforts are expected to increase labor productivity and farm incomes and reduce GHG emissions intensity. Employment will rise through increased demand for wage workers in livestock production. The economic internal rate of return (EIRR) over 20 years for the base case, excluding benefits from GHG emission reduction, is 23.5 percent with a net present value (NPV) of US$238.2 million at a 5 percent discount rate. A sensitivity analysis confirmed the project's economic viability even with a 20 percent increase in project costs and a 20 percent reduction in benefits, resulting in an EIRR of 21.6 percent.

59. **Financial Analysis**. A comprehensive financial analysis was conducted on central livestock production systems in the target provinces to compare improved technologies/practices with current ones, using detailed stock models and budgets (see Annex 2). Financial benefits for project farm households were found in net margins, return to family labor, and investment profitability – all incentives to adopt the project's promoted practices and sustainable repayment of investments.

GHG Analysis

60. **The project is a net GHG emitter, but the implementation of project activities will contribute to mitigation through increased production efficiency, resulting in an emission reduction rate of 41 percent relative to the without project scenario (WOP).** The project leads to an increase in GHG emissions of 14,009 tCO2e per year over the accounting period of 20 years, with respect to the business-as-usual scenario (baseline of the analysis). Most annual net emissions (11,808 tCO2e/year) depend on the augmented number of animals. In particular, the most relevant flux is represented by methane emissions, driven by the increase in the ruminants' herd size (cattle). The construction of new value chain infrastructure will also contribute with 3,831 tCO2e/year of net emissions. However, the introduction of forage production will reduce the annual net emissions by 1,629 tCO2e/year, providing a relatively small mitigation contribution (sink). Also, the productivity enhancements will lead to a reduced emissions intensity of livestock production: unit emissions per head and per ton of meat produced decrease by 18 percent and 35 percent, respectively. The technologies and practices supported under the proposed Project would result in a higher increase in the number of animals with respect to the baseline than under the WOP case (58 vs. 23 percent), but the corresponding emissions will increase less proportionally (29 vs. 23 percent) resulting in an emission reduction rate by 41 percent. As a result, the project will offset the increase in the emissions driven by the bigger size of the herds under the WP (Table A3.4).

61. **Placing a monetary value on the increased GHG emissions (accounted as negative externalities), the base case EIRR decreases to 22.3–21.3 percent under the low- and high-carbon price scenarios, respectively.** Nevertheless, the project will remain viable under both low and high carbon prices: NPVs are positive, and IRRs are above the opportunity cost of capital.

B. Fiduciary

62. **Financial Management.** A Financial Management (FM) Assessment for the proposed Project has been carried out. The assessment has concluded that the project meets the minimum Bank FM requirements, as stipulated in the Bank Policy/Bank Directive for Investment Project Financing. The MAFF and GDAHP will be responsible for the overall project FM. The MAFF and GDAHP have experience with donors funded projects, including World Bank-financed projects. The project will follow the regulations and guidance as set in the SOP for externally financed projects in Cambodia, as well as the PIM. Annex 1 and the PIM contain further details on the project's FM and disbursement arrangements.

63. **Procurement.** Procurement will be carried out in accordance with the World Bank Procurement Regulations for IPF Borrowers dated in September 2023. Procurement under National Procedures will be carried out per the Government of the Kingdom of Cambodia's Updated Standard Operating Procedures on Procurement for All Externally Financed Projects/Programs, promulgated through the sub-decree dated December 2019, which was issued pursuant to Article 2 of the Kingdom of Cambodia's Law on Public Procurement dated May 16, 2023, subject to the additional provisions included in the Procurement Plan in the Grant Agreement. Systematic Tracking of Exchanges in Procurement (STEP), a web-based tool for procurement planning and tracking, streamlining and automation, and monitoring and reporting, will be applicable to this project. Procurement activities will be undertaken by the assigned procurement officer of GDAHP, with support from a procurement consultant. The MAFF and GDAHP, with the support of the World Bank, have prepared a Project Procurement Strategy for Development (PPSD) and an initial 18-month Procurement Plan. The PPSD recommends the procurement approaches to be followed to support project implementation to achieve the PDO and deliver the best value for money. Based on the PPSD, the MAFF and GDAHP developed their initial 18-month Procurement Plan. The key procurement risks, proposed mitigation measures, and procurement arrangements can be found in Annex 1 and the PIM.

C. Legal Operational Policies

Legal Operational Policies	Triggered?
Projects on International Waterways OP 7.50	No
Projects in Disputed Area OP 7.60	No

D. Environmental and Social

64. **The overall environmental and social risk rating is substantial.** The project activities are mainly TA and construction/renovation of value chain infrastructure. This includes grant co-financing to promote the uptake of PaTecs, and feed/fodder production. Eight ESSs are currently relevant to the project.[22]

65. **The environmental risk is rated substantial given the prevalent nature of many zoonotic diseases and potentially significant impacts on human health in Cambodia.** Direct environmental risks and potential impacts include (i) spreading zoonotic diseases/infections due to handling and inappropriate waste management of biological materials (from lab testing, slaughterhouses, markets); (ii) waste, noise, dust, vibration, occupational health and safety for workers, community health and safety associated with civil works; and (iii) resource efficiency and pollution in feed/fodder

[22] ESS1, ESS2, ESS3, ESS4, ESS6, ESS7, ESS8, and ESS10.

production and slaughterhouses and markets. Downstream impacts may arise from TA for increased livestock production, leading to higher feed crop demand, potential forest-to-agriculture conversion, and impacts on habitats and biodiversity.

66. **The social risk is rated moderate**. Impacts include (i) possible exclusion of vulnerable and disadvantaged groups due to improperly designed project service delivery; (ii) risks related to labor and working conditions; (iii) potential impacts on community safety/public health caused by upgrading/construction of value chain infrastructure and minor labor influxes; (iv) risk of increased sexual exploitation and abuse/sexual harassment of vulnerable groups; (v) risks related to adequate stakeholder engagement, including with Indigenous Peoples' communities.

67. **The project will apply standard practices and measures from the World Bank General Environmental Health and Safety Guidelines (EHSG) and Industry Sector Specific EHSGs for livestock and poultry production and processing.** The project has prepared an Environmental and Social Commitment Plan (ESCP), a Stakeholder Engagement Plan (SEP), and an Environmental and Social Management Framework (ESMF), which includes screening tools and procedures for site-specific instruments. The ESMF also includes waste management measures aligned with the Good International Industrial Practices (GIIP) and animal welfare measures from the IFC Good Practice Note on Improving Animal Welfare in Livestock Operations. ToRs for project activities will integrate ESF requirements, addressing potential environmental and social (E&S) risks, including those associated with ESS6. Social exclusion risks will be mitigated by reviewing the implementation of the beneficiary targeting strategy and through a robust GRM to ensure benefits reach vulnerable communities.

68. **Capacity for ESF implementation and monitoring.** Under MAFF, the PIT will include one environmental and one social focal staff/officer. GDAHP will utilize the expertise of MAFF and other relevant ministries to address zoonotic risks through the Z-TWG. Capacity building will be planned for E&S focal persons and other colleagues on ESF instruments.

69. **Stakeholder engagement and information disclosure.** During project preparation, consultations were carried out with government agencies, service providers, private sector parties, and direct beneficiaries. On October 27, 2023, consultation was undertaken on project design, components, and draft ESF instruments involving stakeholders from the target provinces. Feedback was incorporated into the final E&S documents. The draft documents were disclosed on MAFF's website on October 23, 2023[23] and redisclosed on December 14, 2024, https://maff.gov.kh/documentcategory/niwkVBcp3K?lang=k . The final ESMF, ESCP, and SEP were disclosed on both the MAFF and World Bank websites on December 16, 2024. Stakeholder engagement will continue throughout the project life per the SEP.

V. GRIEVANCE REDRESS SERVICES

70. ***Grievance Redress.*** Communities and individuals who believe that they are adversely affected by a project supported by the World Bank may submit complaints to existing project-level grievance mechanisms or the Bank'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 Bank's independent Accountability Mechanism (AM). The AM houses the Inspection Panel, which determines whether harm occurred, or could occur, as a result of Bank non-compliance with its policies and procedures, and the Dispute Resolution Service, which provides communities and borrowers with the opportunity to address complaints through dispute resolution. Complaints may be submitted to the AM at any time after concerns have been brought directly to the attention of Bank Management and after Management has been given an opportunity to respond. For information

[23] See *https://gdahp.maff.gov.kh/document/fLB70WAykG*

on how to submit complaints to the Bank's Grievance Redress Service (GRS), visit http://www.worldbank.org/GRS. For information on how to submit complaints to the Bank's Accountability Mechanism, visit https://accountability.worldbank.org.

VI. KEY RISKS

71. **The proposed project's overall risk rating is substantial**. The project will support innovative and market-based approaches to making the Cambodian livestock sector productive and resilient. Complexity in multi-sector coordination, institutional gaps in MAFF, and environmental, social, and fiduciary aspects carry substantial risks. The capacity building and evidence generated from the project will provide an important base for the implementation of the One Health approach in Cambodia.

72. **Technical Design of Project.** The technical design risk of the project is substantial. Despite streamlining, the activities remain complex, involving innovative approaches for agricultural assets and service delivery and market-led commercialization models that require further development in Cambodia. To manage this complexity, the project will sequence activities by conducting analytical assessments and building technical capacity ahead of complex investments.

73. **Institutional Capacity for Implementation and Sustainability**. The risk associated with institutional capacity for implementation and sustainability is rated substantial due to insufficient capacity to implement the project. To mitigate the institutional capacity risk, the project will leverage the experience of MAFF and GDAHP in implementing similar projects funded by international organizations such as the World Bank and ADB. This will be complemented by adequate TA and project management training for the subnational project implementation entities.

74. **Fiduciary**. The overall fiduciary risk is rated substantial. The project's span across multiple implementing agencies with varying capacities and unclear role definitions poses a significant FM risk, alongside challenges related to the small grant co-financing process, such as beneficiary selection, fund flow arrangements, monitoring proper grant usage, and timely reporting of implementation, which can lead to mismanagement of grant funds. Additionally, the assigned FM staff of the PIT may lack the necessary experience and familiarity with World Bank-financed projects, resulting in ineffective management of project FM. Please refer to Annex 1 for FM actions to mitigate the identified risks. After considering the FM mitigation measures, the project FM risk is rated substantial. The World Bank assessed project procurement risks, proposed measures to address them, and rated the risk substantial after considering mitigation measures presented in Annex 1.

75. **Environmental and Social Risk.** The E&S risk rating is substantial due to activities such as upgrading/renovating slaughterhouses and markets, feed/fodder production, and disease surveillance, as well as the risk of excluding vulnerable groups. Potential environmental risks are predictable, site-specific, temporary, and mitigable. Noncompliance with national requirements in animal husbandry, slaughterhouses, and markets, along with wildlife trade, increases the risk of disease spread. The prevalence of zoonotic diseases and their human-health impact in Cambodia further contribute to the substantial risk. Project activities may generate mitigable moderate, predictable, and site-specific social risks. The ESF instruments (ESMF, SEP, ESCP) outline mitigation measures, budget, stakeholder engagement, capacity building, and monitoring to reduce residual risks.

VII. RESULTS FRAMEWORK AND MONITORING

PDO Indicators by PDO Outcomes

Baseline	Period 1	Period 2	Period 3	Period 4	Period 5	Closing Period
Improved livestock-based livelihoods						
1. Increase in volume of gross sales of livestock and livestock products. (Percentage)						
May/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Dec/2029	Dec/2029
0	0	5	10	15	20	20
2. Farmer adopting climate smart or sustainable livestock technologies or practices. (Number)						
May/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Dec/2029	Dec/2029
0	1,000	2,000	2,500	3,500	5,000	5,000
Improved animal health service delivery						
3. Satisfaction with animal health services provided in the project target area. (Percentage)						
May/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Dec/2029	Dec/2029
0	40	50	60	70	80	80

Intermediate Indicators by Components

Baseline	Period 1	Period 2	Period 3	Period 4	Period 5	Closing Period
Component 1. Promote Inclusive and Sustainable Livestock Value Chains						
4. Number of people receiving direct benefits. (GAFSP Tier 2.2) (Number)						
May/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Dec/2029	Dec/2029
0	2,000	5,000	10,000	20,000	30,000	30,000
➢4.a. Number of people receiving direct benefits - female. (GAFSP Tier 2.2) (Number)						
May/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Dec/2029	Dec/2029
0	800	2,000	4,000	8,000	12,000	12,000
5. Producer groups supported. (GAFSP Tier 2.2) (Number)						
May/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Dec/2029	Dec/2029
0	0	20	50	80	100	100
➢5.a. Women participating in leadership and decision making in producer groups. (GASFP Tier 2.2) (Percentage)						

May/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Dec/2029	Dec/2029
0	0	15	20	25	30	30
6. Number of farmers accessing improved market opportunities. (GAFSP Tier 2.2) (Number)						
May/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Dec/2029	Dec/2029
0	250	1,250	2,500	3,750	5,000	5,000
➢6.a. Number of farmers accessing improved market opportunities - female. (GAFSP Tier 2.2) (Number)						
May/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Dec/2029	Dec/2029
0	75	400	1,000	1,500	2,000	2,000
7. Number of small-scale value chain infrastructure upgraded. (GAFSP Tier 2.2) (Number)						
May/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Dec/2029	Dec/2029
0	0	5	10	15	20	20
8. Reduction in GHG emission intensity of livestock production. (Percentage)						
May/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Dec/2029	Dec/2029
0	0	0	5	10	15	15
9. Farmers receiving inputs or services on climate resilient or sustainable livestock technologies or practices. (CRI and GAFSP Tier 2.2) (Number)						
May/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Dec/2029	Dec/2029
0	1,000	5,000	10,000	15,000	20,000	20,000
➢9.a. Farmers receiving inputs or service on climate resilient or sustainable livestock technologies or practices. (CRI and GAFSP Tier 2.2) (Number)						
May/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Dec/2029	Dec/2029
0	500	2,000	4,000	6,000	8,000	8,000
10. People with enhanced resilience to climate risks. (CRI) (Number)						
May/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Dec/2029	Dec/2029
0	1,000	5,000	10,000	15,000	20,000	20,000
Component 2. Enhance Animal Production and Health Services						
11. Number of farmers receiving extension services (information and training). (Number)						
May/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Dec/2029	Dec/2029
0	2,000	6,000	10,000	15,000	20,000	20,000
12. Persons receiving capacity development support. (GAFSP Tier 2) (Number)						
May/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Dec/2029	Dec/2029
0	100	250	500	750	1,000	1,000
➢12.a. Persons receiving capacity development support - female. (GAFSP Tier 2) (Number)						
May/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Dec/2029	Dec/2029
0	20	60	120	180	240	240
13. Number of local paraprofessionals trained – village animal health workers, commune agriculture officers, & local veterinarians. (Number)						

May/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Dec/2029	Dec/2029
0	200	400	700	1,000	1,300	1,300
14. Number of samples submitted and processed by the diagnostic laboratories. (Number)						
May/2024	Dec/2025	Dec/2026	Dec/2027	Dec/2028	Dec/2029	Dec/2029
0	10	20	30	40	50	50
Component 3. Project Management, Monitoring, Evaluation, and Learning						

Monitoring & Evaluation Plan: PDO Indicators by PDO Outcomes

Improved Livestock-based Livelihoods	
1. Increase in volume of gross sales of livestock and livestock products (percentage)	
Indicator description	Measures the average increase in farmers' sales of livestock and livestock products. It is a proxy for the income farmers generate from livestock production and commercialization.
Frequency	Annually
Data source	Project MIS
Data collection methodology	Survey
Data collection responsibility	MAFF (GDAHP, Department of Planning and Statistics (DPS), M&E focal person/unit)
2. Farmers adopting climate-smart or sustainable livestock technologies or practices (number)	
Indicator description	The indicator measures the number of smallholder armers adopting climate smart or sustainable livestock technologies and mainting the practice at least throughtout the project period. For cases where farmers drop or discontinue a technolgy again, progress reports will document the reasons. The climate smart livestock technologies to be considered will be aligned with project technology and practice packages (PaTecs). The adoption rates are expected to differ per technology. This indicator measures uptake and mantainance over the project period of at least one technology/practice from one category across the PaTecs i.e. breed, feed and pasture management, GAHP, and animal waste management.
Frequency	Annually
Data source	M&E/MIS, progress report
Data collection methodology	Survey
Data collection responsibility	MAFF (GDAHP, DPS, M&E focal person/unit)
Improved Animal Health Service Delivery	
3. Satisfaction with animal health services provided in the project target area (percentage)	
Indicator description	The indicator measures the percentage of smallholder farmers in the project area having access to animal health services who are satisfied with who are satisfied with health servcies. "Satifaction" will include metrics, which measure access to services, reliability of services, percieved quality and utility (i.e. meeting user expectations).
Frequency	Bi-annually
Data source	MIS, progress report
Data collection methodology	Survey
Data collection responsibility	MAFF (GDAHP, DPS, M&E focal person/unit)

Monitoring & Evaluation Plan: Intermediate Results Indicators by Components

Component 1: Promote Inclusive Livestock Value Chains	
4. Number of people receiving direct benefits (GAFSP Tier 2.2) (number)	
Indicator description	Measures the number of direct beneficiaries/training participants reached with project TA, grants, knowledge, training, etc. *The indicator will be reported under GAFSP Tier 2.2 output indicator #1 Number of people who receive direct benefit (people).*
Frequency	Annually
Data source	MIS, progress report
Data collection methodology	Survey
Data collection responsibility	MAFF (GDAHP, DPS, M&E focal person/unit)
4.a. Number of people receiving direct benefits - female (GAFSP Tier 2.2) (number)	
Indicator description	Measures the number of female beneficiaries directly reached by the project with TA, grants, knowledge, and training. *The indicator will be reported under GAFSP Tier 2.2 output indicator #1 Number of people who receive direct benefit (people) - female disaggregated.*
Frequency	Annually
Data source	MIS, progress report
Data collection methodology	Survey
Data collection responsibility	MAFF (GDAHP, DPS, M&E focal person/unit)
5. PGs supported (GAFSP Tier 2.2) (number)	

Indicator description	Measures the number of PGs (agricultural cooperatives and producer organizations) supported through project TA and funding to improve functioning and commercialization. *The indicator will be reported under GAFSP Tier 2.2 output indicator # 9 Number of producer-based organizations supported (organization).*
Frequency	Annually
Data source	Monitoring reports, MIS, and training reports.
Data collection methodology	PG reports, project report, MIS data collection template
Data collection responsibility	MAFF (GDAHP, DPS, M&E focal person/unit)
5.a. Women participating in leadership and decision-making in PGs (GASFP Tier 2.2) (percentage)	
Indicator description	Measures the percentage increase in women in leadership and decision-making positions in producer organizations, such as chairperson, vice chairperson, committee member, treasurer, etc. *The indicator will be reported under GAFSP Tier 2.2 output indicator #9 Number of producer-based organizations supported (organization) female disaggregated.*
Frequency	Annually
Data source	Monitoring reports, MIS, and training reports.
Data collection methodology	PG reports, PG training reports
Data collection responsibility	MAFF (GDAHP, DPS, M&E focal person/unit)
6. Number of farmers accessing improved market opportunities (GAFSP Tier 2.2) (number)	
Indicator description	Measures the number of farmers who have access to improved market opportunities as determined by access to business networking, multi-stakeholder platforms, business forums/trade events, productive alliances, value chain infrastructure, contract farming arrangements, and market facilities to promote and sell their products. *The indicator will be reported under GAFSP Tier 2.2 output indicator #6 Farmers that are supported in accessing improved marketing opportunities (farmer).*
Frequency	Annually
Data source	Monitoring reports, MIS, and training reports.
Data collection methodology	Survey, PG records, and attendance records for market events.
Data collection responsibility	MAFF (GDAHP, DPS, M&E focal person/unit)
6.a. Number of farmers accessing improved market opportunities – female (GAFSP Tier 2.2) (number)	
Indicator description	Measures the number of female farmers with access to improved market opportunities as determined by business networking, multi-stakeholder platforms, business forums/trade events, value chain infrastructure, productive alliances, contract farming arrangements, and market facilities. *The indicator will be reported under GAFSP Tier 2.2 output indicator #6 Farmers that are supported in accessing improved marketing opportunities (farmer) - female disaggregated.*
Frequency	Annually
Data source	Monitoring reports, MIS, and training reports.
Data collection methodology	Survey, PG records, and attendance records for market events.
Data collection responsibility	MAFF (GDAHP, DPS, M&E focal person/unit)
7. Number of small-scale value chain infrastructure upgraded (GAFSP Tier 2.2) (number)	
Indicator description	Measures the number of value chain infrastructure upgrades, including slaughterhouses and markets, based on LBPIs or MOUs between farmers, SMEs, and traders. *The indicator will be reported under GAFSP Tier 2.2 output indicator #5 Number of processing, storage, and market facilities constructed and/or rehabilitated (facility).*
Frequency	Annually
Data source	MAFF, GDAHP report; project M&E system.
Data collection methodology	Survey; review and extract from GDAHP/MAFF report.
Data collection responsibility	MAFF (GDAHP, DPS, M&E focal person/unit)
8. Reduction in GHG emission intensity of livestock production (percentage)	
Indicator description	Measures the percentage change in emissions intensity of livestock production from productivity enhancements achieved via project activities (especially PaTecs) and reduced disease risks; measures the enhancement productivity-induced reduction in unit emissions (per head or per ton of product).
Frequency	Twice during the project (mid-term and end)
Data source	MIS, progress report
Data collection methodology	Monitoring, Reporting, and Verification (MRV) approach imbedded in the project M&E system
Data collection responsibility	MAFF (GDAHP, DPS, M&E focal person/unit)
9. Farmers receiving inputs or services on climate-resilient or sustainable livestock technologies or practices (CRI and GAFSP Tier 2.2)	

(number)	
Indicator description	Measures the number of smallholder farmers receiving productive inputs and/or climate-smart livestock technologies and practices and other climate-related services. The climate-smart livestock technologies and practices to be considered are aligned with project PaTecs. This indicator measures farmers accessing more than two PaTecs. *The indicator will be reported under GAFSP Tier 2.2 output indicator #13. Number of farmers receiving inputs or services on climate-resilient or sustainable agriculture practices (farmer).*
Frequency	Bi-annual
Data source	M&E/MIS, Progress report
Data collection methodology	Survey
Data collection responsibility	MAFF (GDAHP, DPS, M&E focal person/unit)
9.a. Farmers receiving inputs or services on climate-resilient or sustainable livestock technologies or practices. (CRI and GAFSP Tier 2.2) (Number)	
Indicator description	Measures the number of female smallholder farmers receiving productive inputs and/or climate-smart livestock technologies, practices, and services. These technologies/practices align with project PaTecs. This indicator measures farmers accessing more than two PaTecs.
Frequency	Bi-annual
Data source	M&E/MIS, Progress report
Data collection methodology	Survey
Data collection responsibility	MAFF (GDAHP, DPS, M&E focal person/unit)
10. People with enhanced resilience to climate risks. (CRI) (Number)	
Indicator description	Measures the number of smallholder farmers with improved resilience through project interventions; assumes those receiving climate-smart technologies and services through the project will have strengthened resilience.
Frequency	Annually
Data source	M&E/MIS, Progress report
Data collection methodology	Survey
Data collection responsibility	MAFF (GDAHP, DPS, M&E focal person/unit)
Component 2: Enhance Animal Production and Health Services	
11. Number of farmers receiving extension services (information and training). (Number)	
Indicator description	Measures the number of farmers receiving extension services, including farmers receiving information through ICTs, contact with extension service providers (government, private, NGOs, etc.), attending field demonstrations, and receiving training on climate-resilient livestock production and animal health.
Frequency	Bi-annually
Data source	Training attendance list, MIS Reports, field visits, and dissemination records.
Data collection methodology	Monitoring reports, MIS, and training reports.
Data collection responsibility	MAFF (GDAHP, DPS, M&E focal person/unit)
12. Persons receiving capacity development support. (GAFSP Tier 2.2) (Number)	
Indicator description	Measures the number of animal health professionals with tertiary training receiving capacity-building training. These will include national animal health staff at ministries, young professionals, and provincial staff.
Frequency	Bi-annually
Data source	Project report, MIS
Data collection methodology	Training data, attendance list, MIS data collection template
Data collection responsibility	MAFF (GDAHP, DPS, M&E focal person/unit)
12.a. Persons receiving capacity development support - female. (GAFSP Tier 2.2) (Number)	
Indicator description	Measures the number of female animal health professionals with tertiary training receiving capacity-building training. These will include national animal health staff at ministries, young professionals, and provincial staff.
Frequency	Bi-annually
Data source	Project report, MIS
Data collection methodology	Training data, attendance list, MIS data collection template
Data collection responsibility	MAFF (GDAHP, DPS, M&E focal person/unit)
13. Number of local paraprofessionals trained – VAHWs, commune agriculture officers, & local veterinarians. (Number)	
Indicator description	Measures the number of professionals at the local level receiving capacity development training to strengthen the last-mile delivery of animal health services. These include VAHWs, local veterinarians, input suppliers, NGOs, and commune agriculture officers.
Frequency	Bi-annually

Data source	Project report, MIS
Data collection methodology	Training data, attendance list, MIS data collection template
Data collection responsibility	MAFF (GDAHP, DPS, M&E focal person/unit)
14. Number of samples submitted and processed by the diagnostic laboratories. (Number)	
Indicator description	Measures the average number of samples submitted from project areas per year, which will be submitted to and processed by laboratories (national and/or regional); reflects improved processing of disease samples as surveillance improves.
Frequency	Bi-annually
Data source	Project report, MIS
Data collection methodology	Surveillance reports and laboratory records.
Data collection responsibility	MAFF (GDAHP, DPS, M&E focal person/unit)

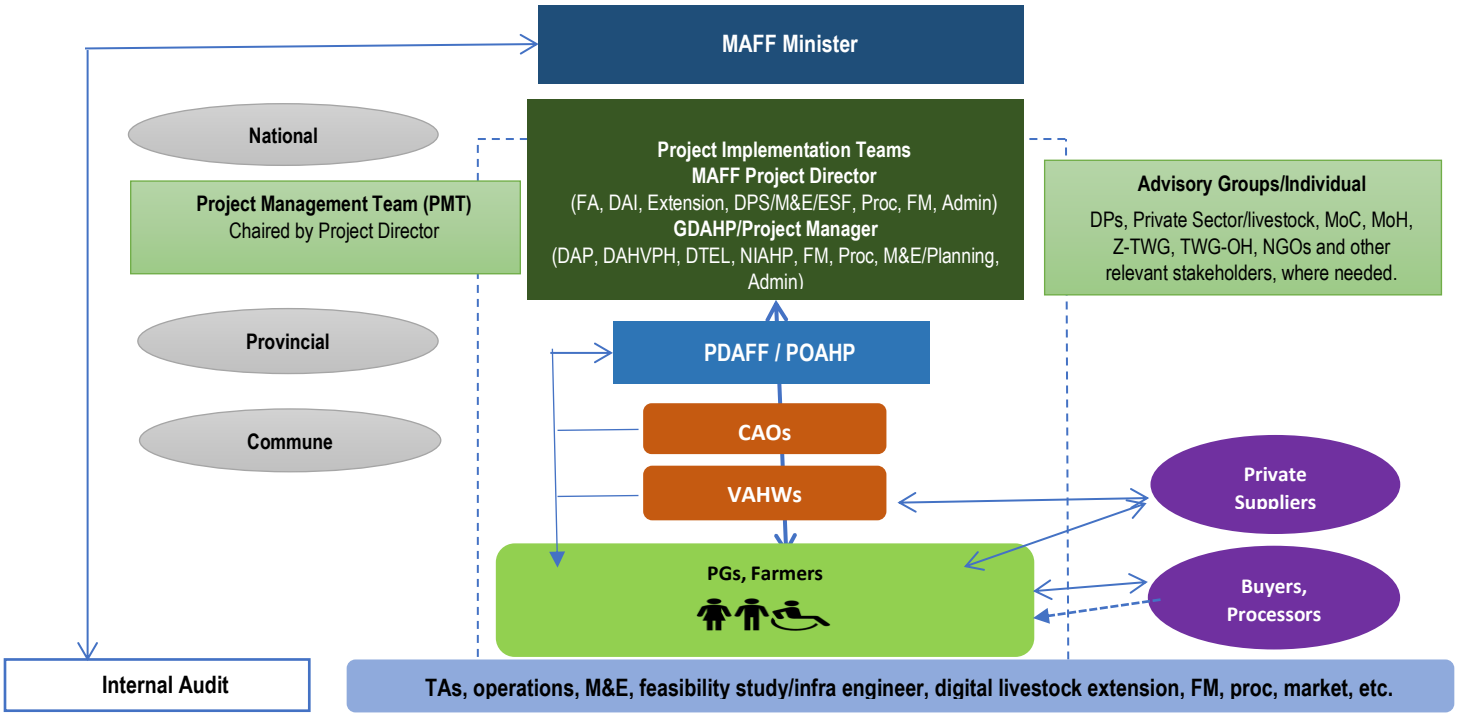
ANNEX 1. Implementation Arrangements and Support Plan

COUNTRY: Kingdom of Cambodia
Cambodia Inclusive Livestock Value Chains Project

I. Project Institutional and Implementation Arrangements.

1. **Project Institutional and Implementation Arrangements:** The project will be implemented over a period of five years. The institutional arrangements for implementation will follow the 'Government Structure', with the Ministry of Agriculture, Forestry and Fisheries (MAFF) in the lead as the implementing agency (IA), including the General Directorate of Animal Health and Production (GDAHP), Forest administration (FA), and other relevant technical line departments at the national level and the Provincial Department of Agriculture Forestry and Fisheries (PDAFF), including Provincial Offices of Animal Health and Production (POAHP). The Ministry of Economy and Finance (MEF) will oversee the financial services support. No separate or parallel structures will be created for the project implementation.

Figure A1.1. Organizational Structure



2. The MAFF has been establishing a project implementation team (PIT) which includes expert(s) assigned from relevant technical, administration, procurement, finance, environmental and social standard (ESS), and M&E units of MAFF, grassroots-level animal health service providers GDAHP, and FA and other related MAFF's line departments, including where relevant for marketing, the Department of Agro-Industry (DAI). The Project Management Team (PMT) consist of Project Director, Project Manager and representative of each technical team will be form as a project management team (PMT) and chaired by the Project Director responsible for the overall management of project implementation and external communication, including the agreed reporting to the World Bank. The PIT will coordinate support for day-to-day planning and implementation. The MAFF will draw on the technical expertise and advice of MAFF and other relevant ministries,

e.g., the MoE and MoH, to implement zoonotic-related activities. Where and when necessary, the teams will be supported by consultants and/or contract staff. Last-mile services will be provided to farmers largely through PGs, by CAOs and VAHWs. Private sector players will be the primary providers of inputs, technologies, and supplies. Roles, responsibilities, and procedures are detailed in the PIM and summarized in Figure A1.1.

Roles and Responsibilities

3. **MAFF.** MAFF is the sole IA for the Cambodia Inclusive Livestock Value Chains Project (CILVCP). MAFF will establish the PMT to ensure broad technical and institutional support and guidance for resolving implementation issues. MAFF will avail senior officials to provide strategic guidance and technical and institutional backup for the PIT and officials in GDAHP, who will lead implementation activities. A small group cross-MAFF will be selected to oversee the approval of grant co-financing prepared by eligible PGs and endorsed by the PDAFF.

4. **Project Management Team.** The PMT will be responsible for the overall management of project implementation and external communication, including the agreed reporting to the World Bank. The Project Director will lead the PMT and include members with senior officials from the main technical units involved in the project support from both national and provincial levels, such as senior staff responsible for FM, procurement, M&E, communication, etc. Consultants and contract staff could, where and when needed, fill capacity gaps in the team. The PMT will be physically located in MAFF. However, as the project is implemented through the existing government (MAFF) structure, including relevant line departments, the PMT staffing will be limited in number but with efficient and effective personnel. The PMT will work under the direct guidance of the Project Director appointed by MAFF.

5. **Project Implementation Team (PIT).** The PIT will be established to support the planning and implementation of the project. The PIT will include team members from GDAHP and other relevant departments of MAFF, including relevant technical experts, administration, finance, procurement, ESS, M&E, etc. The PIT will be responsible for addressing practical and specialized issues arising during the planning and implementation of the project. As such, while the PIT will have a core team for day-to-day project planning and implementation as above, in practice, the PIT will include project teams from different departments in MAFF depending on project activities. The simplified LBPIs will guide the work of project teams. The project teams will provide field visit reports and progress reports to the Project Director.

6. **GDAHP.** Daily major project implementation will be operated by GDAHP, guided by a Project Director, a Project Manager, and relevant senior technical officers at GDAHP. Local and international consultants will assist them in planning and implementation. The GDAHP will assist the PDAFF, POAHP, and CAOs to ensure technical and managerial capacities at the provincial level are built up and/or strengthened for smooth grassroots-level implementation. The MAFF, together with GDAHP, will ensure consultation and cooperation with other important government departments, NGOs, and private sector stakeholders regarding the marketing activities supported by the project.

7. **DAI.** The roles and responsibilities of DAI are to develop policies and programs for solving issues related to agro-industrial and food crop development and formulate agro-industry policy to guide investment in production and processing. The main activities also cover food quality and safety standards, the promotion of agro-industry and agro-food enterprises, and the promoting of investment in agricultural and food exports. From the food quality and safety standard perspective, DAI will be invited to work with GDAHP to upgrade slaughterhouses and public markets and provide technical inputs in livestock production, animal production service delivery, and smallholder market access.

8. **The Zoonotic Technical Working Group (Z-TWG).** The Z-TWG will be invited to provide reviews and recommendations to the PIT on activities related to capacity building and coordination related to zoonoses. The PMT will be invited to

regularly report on the progress of project implementation at Z-TWG meetings. As part of the Z-TWG mechanism, donors and other members will be invited to contribute experience and experts to support project activities where and when needed.

9. **Provincial Project Coordination Office (PPCO).** In each project province, a PPCO will be established at the PDAFF. The PPCO will be composed of at least three people, including a Provincial Project Coordinator, an Admin/Accounting Officer, and a Marketing Officer, to coordinate project activities and produce annual workplans and implementation progress reports. In addition, a Provincial Project Team (PPT) will be established to provide TA, including monitoring activities carried out by the service providers at the field level. The PPT will draw on technical expertise from provincial departments of animal health and production (POAHP), health, and the environment.

10. **PDAFF and POAHP.** Grassroot level implementation, i.e., extension, marketing, and surveillance activities, will be under the responsibility of PDAFF and POAHP. Funding for project field-level activities will be provided through an allocation from MAFF. PDAFF and POAHP will also support local networking between suppliers, producers, and buyers in the livestock value chains. They will also provide awareness raising and training to farmers via PGs and other stakeholders about the project activities, potential grants co-financing, and eligibility criteria. Where necessary, PDAFF and POAHP will be supported by national consultants. PDAFF will recommend project grants co-financing based on the quality and economic feasibility of submitted simplified LBPIs for approval at the MAFF approval committee.

11. **Commune Agriculture Officers (CAOs).** CAOs will support the implementation of project activities, including the funded grant co-financing LBPIs at the grassroots level. The project will cover incremental expenses for project support. The CAOs will (i) develop and disseminate good practices of sustainable, climate-resilient livestock; (ii) support producer organizations/cooperatives to effectively participate in the livestock value chains; (iii) livestock information/statistics; and (iv) identification of issues/problems faced by farmers for timely intervention and solutions. CAOs also deliver extension services information on market demand input suppliers.

12. **Village Animal Health Workers (VAHWs).** VAHWs will be the main (private) animal health service providers. VAHWs will deliver last-mile animal health services and lead disease surveillance in PGs and ACs. They will receive training and capacity building, enabling them to become certificated service providers. Successful candidates will be provided with business start-up kits of up to US$1,000 equivalent to establish village-based animal health services.

13. **Producer Groups (target group).** PGs and their individual members are the primary beneficiaries of project activities and the associated sub-project grants. They will be responsible for implementing the project-funded sub-projects, along with the commitments made in the grant co-financing of simplified LBPIs. The project will provide co-financing support for 100 simplified LBPIs submitted by PGs. Households/beneficiaries will contribute a minimum of 40 percent in cash or through the provision of family labor or other required assets. Cash support for the project is restricted to a maximum of US$700 per household/beneficiary, which includes co-financing for simplified LBPIs, approved inputs, and activities. MAFF and GDAHP will directly pay input or service suppliers for the technologies and services provided to farmers via PGs. Individual livestock producers will cooperate with their PGs to facilitate joint marketing and economic value chain development.

14. **Private Sector.** Inclusive livestock value chain development requires close cooperation with private sector players on the input and output sides. On the input side, this includes suppliers of equipment, forage crop seeds, feed additives, breeding animals and services, chicks, vaccines, etc. On the output side, purchasing, aggregating, processing, and selling will be driven by the private sector in collaboration with small producers via MOUs or business partnerships. The project will fund the upgrade of value chain infrastructure, such as slaughterhouses, which are owned by the state and are

operated by private sector players under long-term lease agreements. The project will fund the upgrade of value chain infrastructure under MOUs or co-developed LBPIs between PGs, traders, and private operators to improve quality and food safety by introducing good manufacturing practices (GMP), HACCP, and other food safety certifications.

15. **Technical Service Providers (TSPs).** The project will hire international and local institutions/firms and/or NGO or individual consultant residents in Cambodia with specific experience in capacity building and specific implementation needs. The TSPs will mainly support government extension services to develop and implement extension support to PGs and PSOs in providing TA on grant co-financing LBPI development and implementation, as well as strengthening institutional capacity for mobilization of producers, governance, FM, business development, and networking.

16. **Implementation arrangement for Component 1.** Promote Inclusive and Sustainable Livestock Value Chains (Table A1.1)**.** This component aims to sustainably improve the productivity of livestock production and orient farmers toward more and more viable commercialization. This will be done through promoting productivity enhancement technology and practice packages (PaTecs), which also build resilience and reduce GHG emissions, and by fostering market-driven commercialization approaches in selected livestock value chains. The activities under this component will contribute to increased returns to producers while enhancing resilience to climate shocks and reducing the GHG emission intensity of livestock production. The component will finance: (i) access to climate-smart PaTecs, (ii) provide TA to improve the organization of farmers and strengthen the operation of PGs, (iii) finance the rehabilitation and upgrade of value chain infrastructure, and (iv) facilitate the linkage between PGs and agribusinesses. Table A1.2. summarizes the technology options per value chain and figures A1.2 and A1.3 detail the implementation structure and grant co-financing structure for component 1.

Table A1.1. Implementation Arrangements for Each Component

Component	Subcomponent	Activities	Responsibility
1. Promote Inclusive and Sustainable Livestock Value Chains	*1.1 Enhancement of Livestock Productivity*	• Grant co-financing for PaTecs, including improved breed, nutrition (feed), GAHPs, and animal waste management • Supporting the functioning of existing PGs for climate-smart production and commercialization.	*MAFF, GDAHP PDAFF, POAHP, CAOs, TA (TSP, individual consultants)*
	1.2 Promoting Smallholder Market Access	• Establishing/strengthening business partnerships between smallholders and agribusiness • Improving common post-production infrastructure, such as slaughterhouses and market facilities	*MAFF, GDAHP PDAFF, POAHP, CAOs, TA (TSP, individual consultants)*
2. Enhance Animal Production and Health Services	*2.1 Strengthening Animal Production Service Delivery Capacity*	• Field demonstrations and training to equip farmers with practical skills • Information, Education, and Communication (IEC) materials for easy access to information and training • A central coordination unit to develop and manage an extension plan and training modules.	*MAFF, GDAHP PDAFF, POAHP, CAOs, TA (individual consultants)*
	2.2 Strengthening Animal Health Service Delivery Capacity	• Strengthening veterinary capabilities of MAFF, GDAHP, POAHPs, CAOs, VAHWs, and private vets • Enhancing surveillance and diagnostic capacities for TADs through an improved local surveillance system.	*MAFF, GDAHP PDAFF, POAHP, CAOs, TA (individual consultants)*
3. Project Management, Monitoring, Evaluation, and Learning		• Operating costs, consultants, and training for fiduciary, environmental, and social safeguards activities • MIS • M&E system	*MAFF, GDAHP, POAHP, CAOs, PPCO, TA (individual consultants)*

Table A1.2. Package of Technologies and Practices (PaTecs)

Value Chain	Breed	Nutrition	GAHP	Waste Management
Cattle	• Artificial insemination – semen (private/VAHWs)	• Fodder growing (seedlings) + training; • Silage (lucena); • Legumes	• Sanitation and hygiene – including shelter improvement & training.	• Composting; integration into crop farming system
Pigs	• Piglet (Piglet producing farm in AC)	• Using local resources to produce feed (cassava leaves); • Silage; • Supplementary commercial feed mixing machines for a few farmers to sell to members.	• Sanitation and hygiene - including shelter improvement & training.	• Composting; integration into crop farming system • Waste management
Chickens	• 21-day-old chick (Hatchery farm in AC)	• Using local resources to produce feed (cassava leaves) • Silage • Supplementary commercial feed • Mixing machines for a few farmers to sell to members.	• Sanitation, hygiene – including shelter improvement & training; Chicken cages;	• Composting; integration into crop farming system

Figure A1.2. Component 1 Implementation

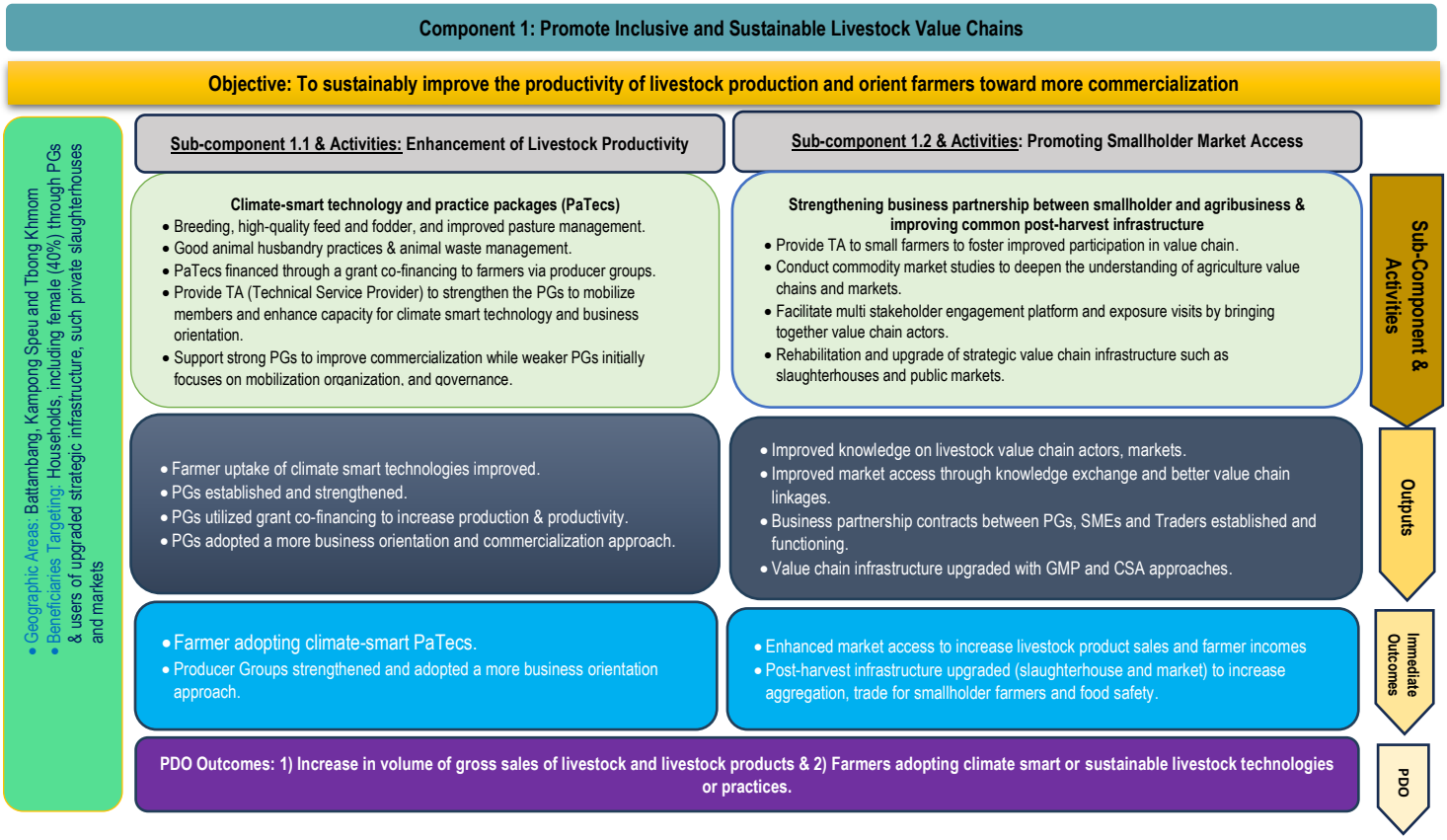
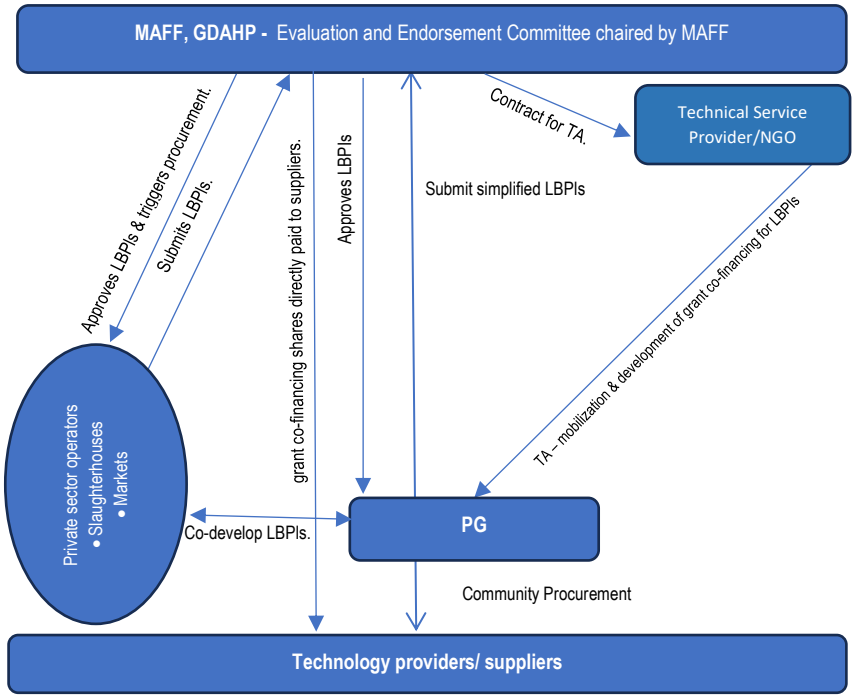


Figure A1.3. Grant Co-financing Implementation Structure



17. **Subcomponent 1.1. Enhancement of livestock productivity.** Activities focus on improving productivity, climate resilience, and reducing carbon intensity. The project will finance:

(a) Grant co-financing to PGs to promote the uptake of ***PaTecs***, including improved breed, nutrition (feed), GAHPs, and animal waste management.
(b) Supporting the functioning of existing PGs for ***climate-smart production and commercialization***.

18. **Subcomponent 1.2. Promoting Smallholder Market Access.** Activities focus on improving smallholder farmers' market access to increase sales and incomes. The project will finance:

(a) Establishing/strengthening business partnerships between smallholders and agribusiness.
(b) Improving common ***post-production infrastructure*** such as slaughterhouses and market facilities.

19. **The necessary governance, FM, and business skills development training for PGs will be provided through TA by an NGO/private sector (TSP) or individual consultant in cooperation and coordination with provincial GDAHP staff.** The TSP will also support PGs in developing viable grant LBPIs for PaTecs. An evaluation committee under MAFF will approve grant co-financing of simplified LBPIs. PGs will procure equipment, inputs, and services from local suppliers, and MAFF will pay the grant portion directly to suppliers. Value chain infrastructure[24] investments will be based on viable simplified LBPIs co-developed by PGs, traders, and private sector value chain asset operators. MAFF will facilitate engagement with infrastructure operators to ensure that strategic value chain infrastructure is upgraded. The project will upgrade up to 20 slaughterhouses and markets, with GDAHP directly procuring goods and services for upgrade based on approved LBPIs.

20. **Implementation Arrangement for Component 2. Enhance Animal Production and Health Services.** This component aims to strengthen extension and animal health services. This will be achieved through enhancing national and subnational capacities to deliver effective services and manage animal diseases. By doing so, the project will increase the resilience of livestock production systems to the growing animal disease burdens and from climate stresses (through improved climate-smart information and animal health) and support livestock herd productivity, thereby increasing livestock production resilience. The project will (i) finance demonstration farms to showcase PaTecs, (ii) provide TA for the development and dissemination of extension information, (iii) support a capacity-building program for national, provincial, and grassroots-level animal health service providers (GDAHP, POAHP, VAHWs, etc.), (iv) establish an enhanced local animal and zoonotic disease surveillance system.

21. **Subcomponent 2.1. Strengthening Animal Production Service Delivery Capacity.** Activities focus on improving farmers' access to extension information and training. The project will finance:

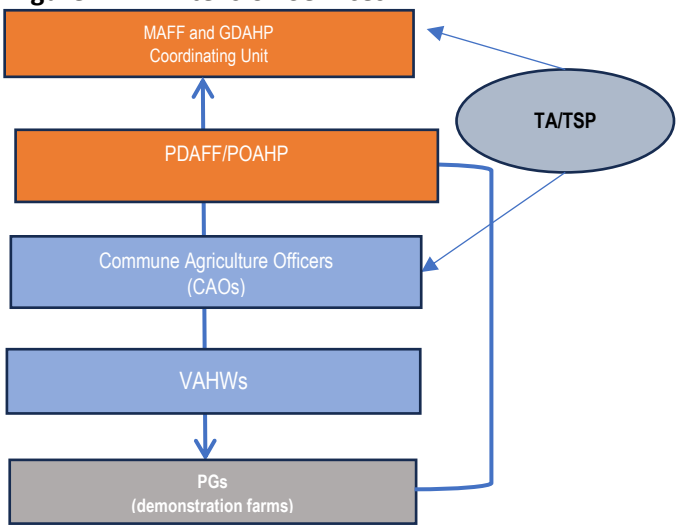
- Field demonstrations and training to equip farmers with practical skills in climate-smart technologies and practices.
- Digital extension system and IEC materials for easy access to information and training.

22. **Guided by MAFF and GDAHP, the project will finance the development and delivery of livestock extension services through demonstration farms, IEC materials, and training to farmers primarily via PGs.** The project will strengthen the capacity of available public institutions – extension workers, MAFF, GDAHP, and POAHP officers, CAOs, VAHWs, and the

[24] Slaughterhouses are operated by private sector players through a long-term lease agreement with government based on a bidding process. Leases are renewable. The project will fund a review of the regulatory framework and fee structures to ensure LPLs can be implemented in a supportive environment.

cadre of CAOs to increase farmers' knowledge and skills in animal production, animal welfare, and climate-smart practices. A central coordinating unit at MAFF, GDAHP, will develop and manage an extension plan and training modules. A TSP will be contracted to support the development of a digital extension system and provide capacity building to MAFF, GDAHP, CAO, and VAHWs for the implementation and sustainability of the system. Figures A1.4 and A1.5 summarize the institutions involved in extension service provision and detail implementation for Component 2. Table A1.3 summarizes the eligibility for financial support by type of project beneficiary.

Figure A1.4. Extension Services



23. **Subcomponent 2.2: Strengthening Animal Health Service Delivery Capacity.** Activities focus on improving capacities to deliver animal health services and perform disease surveillance. The project will finance:

(a) Strengthening veterinary capabilities of MAFF, GDAHP, POAHPs, VAHWs, and private vets.
(b) Enhancing surveillance and diagnostic capacities for TADs through an improved local surveillance system.

Figure A1.5. Component 2 Implementation

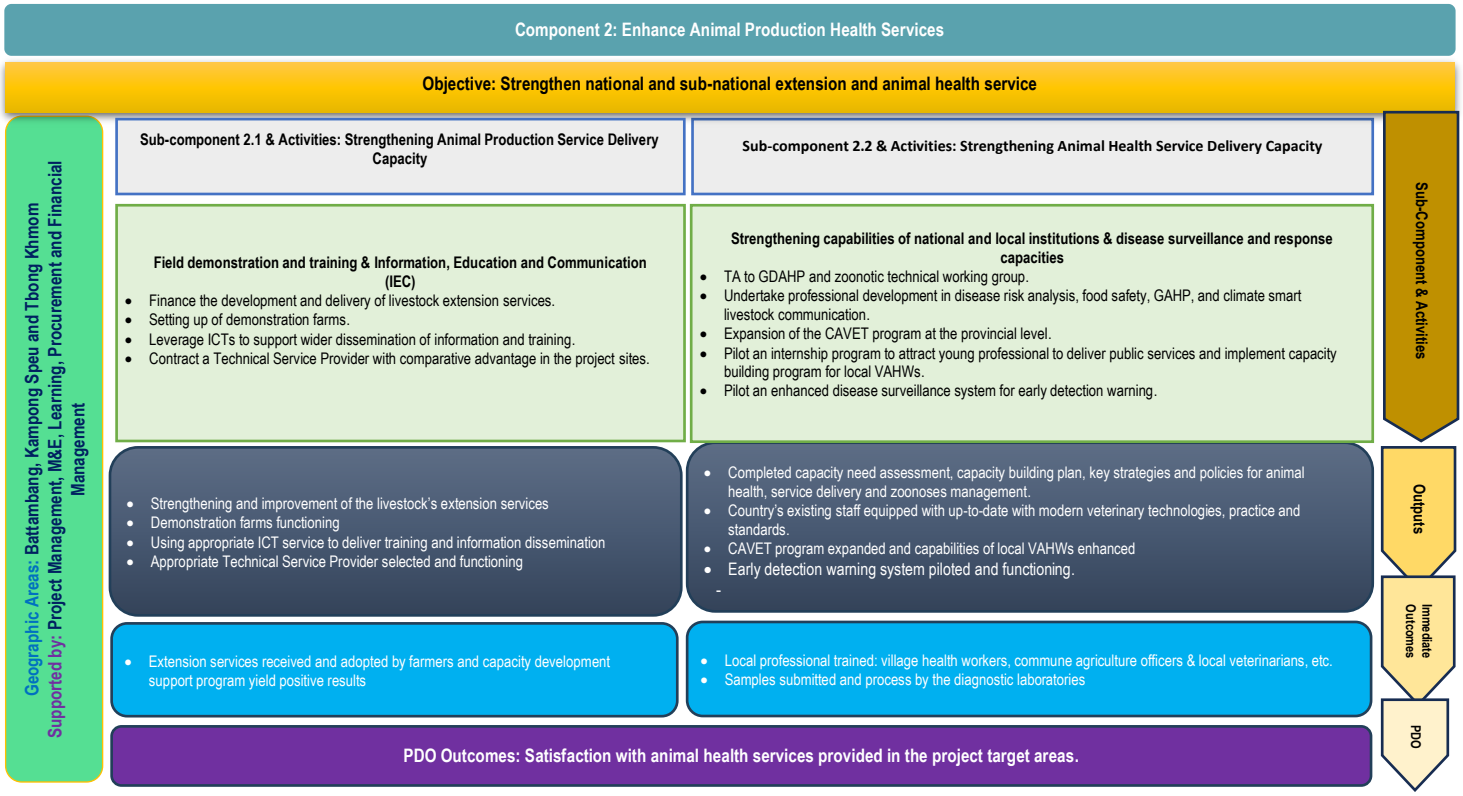


Table A1.3. Summary Eligibility for Financial Support by Type of Project Beneficiary

Type of Project Beneficiary	TA and Training Under the Project	PaTecs Grant Co-financing	Full Grant	Value Chain Infrastructure	Start-up Kits
PGs	√	√			
Private sector operators (slaughterhouses)	√			√	
Public market	√		√	√	
VAHWs	√				√

24. **Led by GDAHP, the capacity building will be carried out by first identifying veterinary services staffing needs and developing capacity-building plans that will be regularly updated to meet the rising needs of the animal health sector**. The project will provide continuous capacity development to strengthen the capacity of GDAHP, POAHP, and VAHWs to provide last-mile animal health services. The project will also finance the setting up of a local disease surveillance system for early detection and early warning, which incorporates GDAHP, POAHP, VAHWs, and other stakeholders in carrying out regular surveillance for transboundary animal diseases and zoonoses at the village level and in slaughterhouses and markets to facilitate early detection and early action.

25. **Implementation arrangement for Component 3. Project Management, Monitoring, Evaluation, and Learning:** This component will finance operating costs, consultants, and training for fiduciary, environmental, and social safeguards activities, along with progress reporting. It will support the development of a management information system for tracking results and establish a robust monitoring system to measure impacts. The project will also pilot a system for tracking GHG emission reductions and implement surveys for systematic assessments and lessons learned. This component also includes mid-term and final evaluations led by consultants and independent institutions. Responsibility for these activities lies with the PMT in MAFF.

26. **M&E.** The project will develop a dedicated M&E system for tracking project inputs, activities, outputs, and impacts across all components in all the project districts. This M&E system will be part of the project MIS. Data collection will be done by PIT at the national and in the project provinces. The PMT is responsible for the overall analysis and reporting. The PMT will be supported in their M&E activities by a specialized M&E and operations consultant. Additional M&E consultants could also support the project work if needed.

II. Procurement

27. **In terms of procurement capacity, risk assessment, and mitigation measures, the risks and mitigation measures shown in Table A1.4 have been discussed and agreed upon with the Government and are included in the PPSD.** The World Bank has conducted a project procurement risk assessment for the project and noted that MAFF has implemented several World Bank-financed projects and other development partner-funded projects, using separate PITs based in the ministries' departments managing the projects. However, the assigned procurement officer has no experience implementing public procurement and managing procurement activities funded by the World Bank projects. The overall project procurement risk is Substantial. Table A1.4 show the key procurement risk and mitigation measures.

Table A1.4. Procurement Capacity and Risk Assessment

Risks Description	***Description of Mitigation***	***Risk Owner***
GDAHP has no experience implementing WB-funded projects and lacks in-house capacity and resources in contract management	• Provide procurement training to MAFF and GDAHP's staff, including initial training during project preparation and in-depth procurement trainings during project implementation.	MAFF, GDAHP, and WB

for large consultancy service packages and work procurement packages. However, MAFF does manage WB financing projects such as CASDP and LASED III**.**	• The IA will assign one focal person for the implementation of STEP and monitoring the procurement tracking form. • The project will select an engineer for Feasibility study, detail design, and upgrading supervision. The selected engineer will support the project team in managing work contracts. • The Contract Management Module in STEP will be used to monitor the progress of contracts and the delivery due date of each activity to ensure the services/works are completed as agreed in the contract.	
The procurement of large consulting contracts in the past was often delayed and time-consuming.	• The IA will assign one focal person for the implementation of STEP and monitoring the procurement tracking form. • Advice MAFF and GDAHP to seek HEIS for the initial project implementation period. • Closer coordination between Implementing Departments and follow-up to get technical inputs on time. • The TSP's ToRs to support PGs need finalizing for the project to be effective.	MAFF, GDAHP
Possible delay in internal clearance of BEC/CEC/PRC**.**	• MAFF and GDAHP will agree on the service standard included in PIM, a procurement tracking form will be implemented, and sufficient delegation of authority will be provided to the members of BEC/CEC/PRC.	MAFF, GDAHP
Corruption, fraudulence, and impartiality in procurement remain persistent issues in the country context and can potentially compromise fair competition.	• Require PMT procurement staff involved in the procurement process to declare their potential conflict of interest and sign a Transparency and Ethics Statement before carrying out their work. • Carry out due diligence throughout all stages of the procurement process to identify potential conflicts of interest and fraud/corruption concerns and take prompt, appropriate measures to address them. • Effectively enforce the implementation of the existing procurement complaint-handling mechanism. • Require enhanced disclosure of procurement information, including publication of the annual Procurement Plan and a quarterly summary of the contract award information for all procurement packages on the project website and in newspapers.	MAFF, GDAHP
Contract implementation delays and substandard quality due to contractors' inadequate mobilization and poor performance.	• Carry out due diligence on selected contractors/consulting firms before contract award. • Strictly manage the contractor's mobilization of committed resources and their performance. • Contract Management Plan shall be prepared for a high-value consulting service package and regularly monitored to ensure the services/works will be completed based on the agreed timeline in the contracts.	MAFF, GDAHP

28. **Institutional arrangements for procurement:** Procurement activities will be undertaken by the assigned procurement officer of the MAFF and GDAHP with support from a procurement consultant(s). The project will provide a grant co-financing to farmers through PGs based on the submission and approval of simplified LBPIs, up to 60 percent from the project and 40 percent from the households, to enhance livestock productivity. The contribution of 40 percent by households will be collected/facilitated by PGs on behalf of their members and verified by PIT. In addition, the PGs will carry out procurement activities financed under the grant co-financing on behalf of their members, and procurement manuals for PGs will be developed to implement procurement under the grant co-financing.

29. **Applicable procurement procedures:** Procurement will be carried out per the World Bank Procurement Regulations for Borrowers Fifth Edition, updated September 2023. Procurement under National Procedures will be carried out by Government of the Kingdom of Cambodia's Updated Standard Operating Procedures and on Procurement for All Externally Financed Operating Procedures on Procurement for All Externally Financed Projects/Programs, promulgated through the Sub-decree dated December, 2019, which was issued pursuant to Article 2 of the Kingdom of Cambodia's Law on Public Procurement dated May 16, 2023, subject to the additional provisions included in the Procurement Plan in the Grant

Agreement. Systematic Tracking of Exchanges in Procurement (STEP), a web-based tool for procurement planning and tracking, streamlining and automation, and monitoring and reporting, will be applicable to this project. All applicable procurement rules and procedures and procurement documents will be elaborated and referred to in the Project Implementation Manual prepared by the Borrower and acceptable to the World Bank.

30. **Procurement scope under the project as identified in the PPSD**: An estimated budget of US$8.54 million will be spent for all procurement activities under this project. Out of this estimated budget, about US$2.7 million will finance the upgrading of community slaughterhouses and market facilities; US$4.54 million will finance all consulting services; and US$1.3 million will finance goods (technical and equipment/tools, office equipment, vehicles, and others).

31. **Procurement plan:** Based on the PPSD, the MAFF PIT prepared the first 18-month Procurement Plan for the project, which was agreed upon with the World Bank. It is attached as the PPSD's Annex.

32. **Prior review threshold**: After applying the agreed risk mitigation measures, the procurement risk under this project is considered Substantial. The prior review thresholds by procurement type are shown in Table A1.5.

Table A1.5. Prior Review Thresholds by Procurement Types

Type of procurement	Estimated contract amounts (US$, million)
Works	10
Goods, information technology, and non-consulting services	2
Consultants: Firms	1
Consultants: Individuals	0.3

33. **Use of STEP**: STEP is a web-based tool for procurement planning and tracking, streamlining and automation, and monitoring and reporting. It is applicable to this project.

34. **The World Bank's oversight of procurement will be done through increased implementation support when requested by the client.** Procurement supervision will be part of the semi-annual project implementation support missions, and procurement clinics/trainings will be conducted based on need. In addition to the prior review by the World Bank based on the prior thresholds, which are subject to change according to the result of risk assessments carried out during project implementation, the World Bank will carry out an annual procurement post-review on a sample of at least 20 percent of all post-review contracts financed by the project. STEP will help the World Bank monitor the progress of procurement and take appropriate supportive actions. The World Bank also requires the assigned procurement officers of the PMT to promptly update the procurement tracking and monitoring form in the SOP to monitor procurement performance.

III. Financial Management

35. **A Financial Management (FM) Assessment for the proposed project has been carried out.** The assessment has concluded that the project meets the minimum Bank FM requirements, as stipulated in the Bank Policy/Bank Directive for Investment Project Financing (Table A1.6).

36. **Implementation arrangement and staffing:** The MAFF and GDAHP will be responsible for the overall FM of the project. The project will follow the regulations and guidance as set in the Standard Operating Procedures for externally financed projects in Cambodia (SOP) as well as the Project Implementation Manual (PIM), which provides additional project-specific guidance for activities, implementation arrangements, and FM. The PIM will need to be adopted by *Project*

Effectiveness.

Table A1.6. FM Capacity and Risk Assessment

FM Risk	Action/Mitigation	Responsible Party	Completion Date
The project activities span several implementing agencies, of which capacities may vary, and the roles and responsibilities may not be adequately defined.	Develop and adopt the PIM, which provides additional project-specific guidance for activities, implementation arrangements, and financial management, particularly the guidance on grant co-financing. Internal Audit (IA) should be established for the project.	MAFF	Final draft PIM by Negotiation Adoption of PIM by Effectiveness. IA within the first year of project implementation.
The project includes grant co-financing, which may be challenging to arrange.			
The assigned FM staff of the PIT may not have experience and familiarity with the World Bank-financed projects.	Training of FM to assigned FM staff. Accounting software will be procured.	MAFF	Training by Effectiveness. Accounting software within 6 months of project signing.

37. **Accounting system.** The project will follow the accounting policy and guidance as set out in the SOP/FMM. The project will procure a suitable accounting software within 6 months of project signing.

38. **Budgeting and planning.** The project will follow government budget principles as outlined in the SOP/FM and MEF-issued additional instructions for Annual Work Plan and Budgets (AWPB) preparation, including the template of AWPB and quarterly cash forecast. Steps and timeline for preparation of AWPB are detailed in the FM as a chapter of the PIM. The budgeting section should require at least (i) The AWPB to be reviewed by the Bank, (ii) The 4-quarter rolling plan to be prepared by each IA, and (iii) The variances analysis to be prepared and briefly included in the six-month Interim Financial Reports (IFRs).

39. **Internal controls.** The project will follow the SOP/FM, which should contain the key principles of controls such as (i) Appropriate delegation of authorities, (ii) Segregation of duties, (iii) Security of assets and records, and (iv) Transparency. The FMM would set out the specific controls of assets (cash, advances), management of contracts, coordination in FM operations among the implementing agencies, types of eligible expenditure, and, in particular, detailed guidance on grant co-financing. For grant co-financing, the guidance should include at least the following: (i) the selection process of beneficiaries, (ii) guidance of eligible expenditure, (iii) fund flow arrangements, (iv) simplified guidance of books, records, and reports, and (v) supporting the beneficiaries and monitoring the proper uses of grants.

40. **Financial reporting and audited financial statements.** MAFF and GDAHP will prepare the consolidated IFRs for the project semi-annually. They will be submitted to the Bank within 45 days of the end of the reporting period. The format and contents of the IFR will be provided in the FM. **The Project Financial Statements will be prepared by GDAHP, audited on an annual basis and submitted to the Bank within 6 months of the year end.**

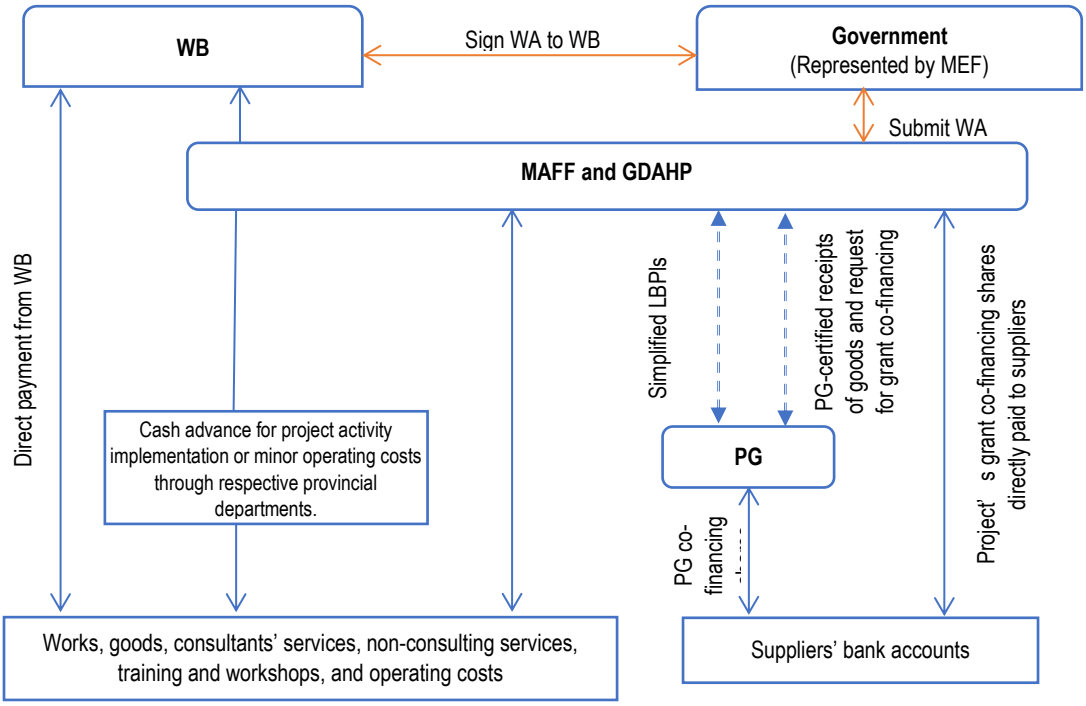
41. **Grant co-financing.** The project will provide grant co-financing of 60 percent (or up to US$700 per household/beneficiary, whichever is lower) of the total grant co-financing LBPI amount. The PGs must raise, through their beneficiaries/households the remaining 40 percent as their own contribution in cash or kind. The PGs will carry out procurement activities financed under the grant co-financing on behalf of their members applying for community procurement. Upon receiving a request for grant co-financing payment from PGs with certified receipt goods and services, MAFF will transfer grant co-financing shares directly to suppliers. Table A1.7 presents the co-financing and incentive program disbursement categories, while Figure A1.6 illustrates the fund flow.

Table A1.7. Co-Financing and Incentive Program - Disbursement Category

Disbursement Category	Allocated of the Grant Amount (US$)	Financing Percentage (inclusive of taxes)
(1) Grant co-financing facility	7,000,000	100%
(2) Goods, works, non-consulting services, consulting services, training, and operating costs under other parts of the project	13,000,000	100% of disbursed amount
TOTAL	20,000,000	

42. **Disbursement.** A segregated Designated Account (DA) in US$ will be opened at the National Bank of Cambodia. The DA has a variable ceiling equivalent to a two-quarter cash forecast. The frequency of reporting of expenditures paid by the DA shall be quarterly. The minimum application size for reimbursements, special commitments, and direct payments will be US$100,000. The project will have a Disbursement Deadline Date of four months after the Closing Date. This is the final date the World Bank will accept applications for withdrawal from the Recipient or documentation on the use of credit proceeds already advanced by the World Bank.

Figure A1.6. Fund Flows



IV. Strategy and Approach for Implementation Support

43. **The project's implementation support plan follows the expected 'stages', with different activities becoming the focus as implementation progresses.** The implementation support plan also responds to key risks identified for the proposed project, mainly relating to the inadequate knowledge and lack of experience of the PMT and project team staff.

44. **Oversight and implementation support will also cover the project's procurement, FM, and ESF.** The main strategy and approach for implementation support to manage the identified risks include capacity building for the PMT and project team and close project monitoring and implementation support, especially during the first two years of project implementation. Mitigation measures have been proposed and discussed with the MAFF, GDAHP, and their line

departments. They will be adopted as adequate during project implementation. At the same time, it is expected that specific activities included in the AWPBs will complement the World Bank's implementation support. The limited capacity and geographical coverage of project locations will result in a significant need for implementation support and regular communication with counterparts. The key tasks strategy and approach for implementation support will include (i) capacity building of PIT and project teams; (ii) improvement of project governance; (iii) strengthening business partnership between farmers and private sector operators; (iv) enhancement of post-harvest facilities; and (v) follow up on the monitoring and reporting prepared by the PIT on implementation progress and achievement of results.

45. **Building capacity of the PMT and PITs:** Given that this is the first time for GDAHP to implement a sizable World Bank Project with the project team staff having limited experience with the proposed approach, substantial training and capacity-building activities for implementing and oversight agencies are required to enhance the capacity of key project team members and be familiar with World Bank procedures. Ongoing capacity development will also strengthen the capacity of GDAHP, POAHP, and VAHWs to provide last-mile animal health services. Furthermore, frequent project communication, together with field visits by the World Bank and regular implementation support missions every six months, will be carried out to proactively react and discuss issues before becoming problems. TA during project implementation will provide timely guidance and advice to the IA, especially at the provincial and district levels where technically complex planning and implementation issues might emerge.

46. **Enhancement of project governance:** Governance risk associated with the project's grant co-financing to PGs and support to PSOs is a key concern compounded by low capacity at local levels, which can negatively affect the project implementation. A detailed grant co-financing guideline will be developed to serve as the roadmap for managing grant co-financing to PGs. The guidelines will enhance project governance and effectively and efficiently manage the grant co-financing to increase livestock productivity. A TSP will also be contracted to assist and coordinate with GDAHP/MAFF in administering grant co-financing and support PGs to prepare feasible grant co-financing LBPls to implement PaTecs. In addition, this project clearly defines the roles and responsibilities of each IA, including Grievance Redress Mechanisms.

47. **Intensive monitoring and implementation support:** Intensive monitoring and implementation support in the initial period will be required to reduce the risk at the maximum level in addressing technical planning and implementation issues. The risks of noncompliance in procurement, FM, and safeguards implementation will require intensive monitoring and implementation support at an early stage of project implementation. This will help identify issues on time and address them before they become major problems. Intensive monitoring and implementation support will be maintained until the capacity of the project staff has been improved or the project's TSP Team has proven to be functioning effectively.

48. **Strengthening business partnerships between farmers and private sector operators:** Poor linkage among farmers and PSOs is widely accepted and requires immediate attention to minimize market inefficiency. To overcome this constraint, the project team will select a firm to conduct commodity market studies on the livestock value chain, which will be complemented by conducting a multi-stakeholder agricultural trade fair dialogue platform and exposing exchange visits for PGs in different provinces to learn from success stories and good agriculture practice.

49. **Enhancement of post-harvest facilities:** Private slaughterhouses and public market facilities lack hygiene and are underdeveloped. These facilities need to be improved to comply with GAHP and promote food safety, thereby increasing sale value and volume, which will translate into higher household income. As part of this initiative, the project strategy will initially contract a firm to conduct a feasibility study of the post-harvest facilities by designing and upgrading 14 private slaughterhouses and 6 market facilities at the district level to promote smallholder market access and enhance consumer confidence.

V. Implementation Support Plan and Resource Requirements

50. **The World Bank task team will provide intensive implementation support during the first year of project implementation,** focusing mainly on the implementation of the various agreed risk management measures, as well as on fiduciary safeguards and governance aspects (Table A1.8). In addition to two comprehensive implementation support missions, one or two interim missions will be fielded based on project needs. Close cooperation with GDAHP and MAFF staff during missions will serve as an additional element of capacity building.

51. **After two and a half years of project implementation, a mid-term review mission will be conducted to assess the progress and challenges toward achieving the PDO**. It will also identify any changes needed and possible implementation to the project, including a possible additional resource from other sources of funding. No later than six months before the expected project closing, an Implementation Completion and Results Report (ICR) Review mission will be deployed to undertake a comprehensive assessment of the project and draft the World Bank ICR, as well as to guide the GDAHP and MAFF in preparing the required documents.

Table A1.8. Implementation Support Plan and Resource Requirements

Time	Focus	Skills Needed	Resource	Estimated Annual Budget (US$ per year)	Partner Role
Year 1-2	• Baseline survey and set up for accompanying impact evaluation • Awareness raising and outreach campaigns in the target three provinces • Safeguard supervision • Preparation of extension strategy • Testing of ICT approaches	• Technical support specialists (policy, institutional, regulations, gender, livestock, operations, M&E) • Procurement • FM • ESF	Bank staff FAO Cooperative Program (CP)	210,000 60,000	• NGOs and TWG-AW contributing their own expertise and resources • Sharing experiences and learning other relevant projects
Year 3-5	• Identify and test appropriate extension content and delivery mechanism • Strengthening partnerships between farmers and private-sector operators • Main infrastructure for post-harvest facilities • Mid-term evaluation of the project • Implementation of mid-term review recommendations on the project management system • Technical adjustments of project activities	• Technical support specialists (policy, institutional, regulations, gender, livestock, operations, M&E) • Procurement • FM • ESF	Bank staff FAO CP	210,000 60,000	• NGOs and TWG-AW contributing their own expertise and resources • Sharing experiences and learning other relevant projects
Project Closing	• End-term evaluation and project completion report • Dissemination of the project outcomes, lessons learned, and mainstreaming of good practices	• M&E • Sector technical specialist	Bank staff FAO CP	210,000 60,000	Consultation and feedback

52. **Skill mix and partners:** Table A1.9 presents the skill mix and team composition for supporting project implementation, while Table A1.10 lists the partners and their roles.

Table A1.9. Required Skills Mix

Skills Needed	No. of Staff Weeks (per year)	Number of Trips (per year)	Comments
Task Team Leader	6	n.a	Based in-country
International Operations and M&E Consultant	6	2	International
Agricultural Economist/ Livestock Value Chain Consultant	10	n.a	Based in-country
Livestock and post-harvest Specialist	4	2	International
Procurement Specialist	3	n.a	Based in-country
FM Specialist	3	n.a	Based in-country
Social Specialist	2	n.a	Based in-country
Environmental Specialist	2	2	International
Gender Specialist	2	n.a	Based in-country
Communications Specialist	2	n.a	Based in-country
Operational support consultant	8	n.a	Based in-country

- Technical missions will supplement the regular ISMs as needed.

Table A1.10. Partners

Name	Institution/Country	Role
TWG-AW	Development Partners and other main stakeholder institutions for sector-wide coordination and cooperation (local/Cambodia)	•Providing coordination and cooperation support •Providing technical expertise and experts for project implementation support through TWG-AW Secretariat
FAO	Headquarters in Rome and Representation in Cambodia (local office)	•Implementation support as co-chair of TWG-AW

ANNEX 2. Economic and Financial Analysis

COUNTRY: Kingdom of Cambodia
Cambodia Inclusive Livestock Value Chains Project

I. Introduction

1. **Overview**: This Annex reports the results of the financial and economic analysis related to the Cambodia Inclusive Livestock Value Chains Project (CILVCP). The project will improve livestock-based livelihoods and strengthen animal health services in target areas.

2. **Economic benefits:** This project will generate significant benefits for the livestock subsector in Cambodia as a whole and for the livestock producers in the target provinces. The main economic project benefits are expected to come from (i) an increase in the size of the stocks of farmers' beneficiaries and an improvement of their productivity thanks to the adoption of PaTecs, which include implementation of breeding, improved feed, fodder production, GAHP, animal waste management; (ii) losses to be avoided from reduction of disease incidence in the project areas; (iii) introduction of forage production for better crop-livestock system integration; and (iv) improved post-production management, value addition, and marketing. These benefits are expected to increase labor productivity and farm incomes and reduce GHG emissions intensity – a global benefit. Employment is expected to be generated through increased demand for wage workers to contribute to enhanced livestock production. The investments in infrastructure will generate further employment opportunities during project implementation.

3. **Structure of the analysis:** The analysis aims to prove the proposed investments' financial and economic viability. Based on a set of models, the financial analysis is reported in section II. The economic analysis, which includes a description of the expected project benefits, is described in section III. The net benefits derived from the activity level models in the form of incremental benefits concerning the baseline are aggregated in the economic analysis considering the scale of the project and its targets to assess overall benefits generated from the proposed project interventions. Such benefits are compared with the project costs (estimated from the budget) to assess overall project performance indicators. The economic analysis incorporates the results of the GHG analysis, too.

4. **The analysis has been conducted based on the available information and data and to the best of the Author's knowledge**. The validity of the analytical assumptions may limit the findings presented here. All assumptions and calculations are transparently shown in the companion Excel file, which is accessible to the reader.

Financial Analysis

5. **Objectives**: The objectives of the financial analysis are: (i) to assess the financial viability of the development interventions promoted under the project; (ii) to examine the impact of project interventions on the incomes of the households (HHs) targeted, therefore determining the incentive for the target group for engaging in the proposed activities; and (iii) to establish the framework for the economic analysis of the project, which will complement the financial analysis to assess the justification from the overall economy' perspective (see section III).

6. **Data:** Quantities and costs of the inputs used in livestock management, including labor utilized in the different operations, as well as the technical coefficients and the output farm gate prices, have been collected during design from August to December 2023. Collected data refer to both 'without project' (WOP) and 'with project' (WP) scenarios. Secondary data sources have been used to integrate the information available and to cross-check our findings, including data available in the literature and in official statistical datasets. Activity budgets are calculated based on financial (farm

gate) prices for the financial analysis. For the economic analysis, they are converted into economic prices using *ad hoc* conversion factors. The effects and impacts of climate change are accounted for in risk and sensitivity analysis.

7. **Methodology and main assumptions**: The economic rationale for the analysis hinges on the better productivity of smallholder livestock keeping, thanks to the adoption of improved technology practices promoted by the project. The analysis is developed by building financial activity models at the smallholder farm household level. Models should be seen only as representative and can eventually be combined into more complex investment options. They refer to average socio-economic conditions in the area. An overall conservative approach is adopted in the models not to overestimate potential benefits, and modelled productivity increases that are consequent to the implementation of the improved technologies promoted by the project are not unrealistic. The activity models simulate financial budgets and estimate financial performance indicators (namely, gross margins, net margins, and returns to family labor) that are instrumental for assessing the impact of project interventions on the economic activities of targeted smallholders.

8. **Gross margins (cash flow) are computed as a difference between total revenue and total operating (variable) costs.** Total revenue is computed considering all farm output valued using the farm gate market price. No self-consumption is considered since the analysis aims to estimate farm household incomes in the WOP and WP scenarios and does not indicate how the income is spent. In any case, including food consumption in the computations would not change the analytical results, as there would be no difference between the value of food purchased on the market and the foregone revenue corresponding to the self-consumption.

9. **The operating costs include the costs for running the activities conducted every year during the intervention period and, after that, during the operational phase of the project.** They include hired external labor but exclude family labor costs. Net margin is derived by subtracting from the gross margins the costs of family labor[25]. Returns to family labor are computed as the ratio between the gross margin and the quantity of family labor involved in the production activity. They indicate how much is earned for each day of work and provide an indicative assessment of the convenience of undertaking the farming activity. Since the goal of the analysis is to consider all the input costs, labor is valued in the same way, no matter if the laborer is a family member or an external laborer.

10. **The models provide performance indicators both for the WOP scenario – the baseline of the analysis – and the WP one.** The investment costs related to project interventions (e.g., dissemination of technology packages) are not directly considered in the activity models since they are already computed within the overall project costs. The difference between net margins in the WOP versus WP scenarios represents the net incremental financial benefits of switching from WOP to WP management. The WOP scenario refers to conventional livestock management activities where farmers do not adopt suitable technologies and productivity is below the potential. The WOP models represent the current situation, which is assumed to remain unchanged during project implementation. The WP scenario simulates the impact on the project beneficiaries of the activities funded through the project.

11. **Model specifications**: The models in Table A2.1 are included in the financial analysis.

Table A2.1. Models Included in the Financial Analysis, Without and With Project

Model Description	WOP	WP
1. Cattle rearing, beef and milk production, model data for 1 year.	Conventional management, no use of forage feed, higher mortality rates, lower fertility rates, and lower productivity.	Improved rearing, better animal health conditions, lower mortality rates, higher fertility rates, and higher productivity.

[25] All costs borne at farm HH level have been included in the models. Thus, HHs' financial capacity to cover the incremental production costs is already considered in the net margins and corresponding HHs' incomes.

2. Pig rearing (sow, piglets, and pig fattening): model data for a cycle of 6 months and 2 cycles per year.	Conventional management, lower productivity.	Improved rearing, higher productivity, and reduced mortality rates.
3. Local chicken production. Model data for a cycle of 4 months and 3 cycles per year.	Conventional management, lower productivity.	Improved rearing, higher fertility and productivity, and reduced mortality rates.
4. Forage production model data for 1 growing season.	-	Under this scenario, farmers will grow forage crops to produce hay/fresh forage for cattle feeding. An exemplificative model for mung bean grown for fodder as hay, straw or silage is built.
5. Maize production, model data for 1 growing season.	This model is built to assess the opportunity cost of converting part of the farmland to forage production for cattle feeding (see model 4). Rainfed maize is chosen as a representative baseline crop.	-

Summary tables with the main assumptions adopted for the models are reported in Tables A2.2 to A2.14.

Table A2.2. Model 1 - Cattle Rearing

Assumptions and Parameters		Unit	Detail	
Marketing	Purchase price - calf, 6-8 months	Riel/head	1,300,000	
	Purchase price - heifer	Riel/head	2,200,000	
	Purchase price - breeding cow	Riel/head	260,000	
	Purchase price - breeding bull	Riel/head	8,000,000	
	Purchase price - ox	Riel/head	2,200,000	
	Carcass, sale price at abattoir	Riel/Kg DW	33,000	
	Slaughtering fee	Riel/head	10,000	
	Movement fees	Riel/head	4,500	
	Transport costs	Riel/head	160,000	
	Milk, sale price on farm	Riel/Kg	4,000	
Labor	Family labor	Riel/person day	3,600	
	Family labor	person-days/yr	100	
Feeding	270 days for pregnancy period Feeding 20kg/cow/day	Riel/head	1,978,000	
	30 days before mating grassing 20kg/cow/day	Riel/head	219,834	
	Raising a calf until 540days Grassing 10kg/calf/day		1,978,000	
	Feeding	Riel/head/day	2,500	
Animal husbandry	Treatment (dipping, spraying)	Riel/head	70,000	
	Vaccine and medicine for a cow	Riel/head	9,160	
	Vaccine and medicine for a calf	Riel/head	6,100	
Investments	Housing	Riel	2,500,000	
Other costs	Miscellaneous expenditure	% of gross revenue	5%	
Years			WOP	WP
Other technical parameters	Calving rate	%	60%	80%
	Lactating cows	%	40%	50%
	Calf mortality	%	18%	10%
	Weaner mortality	%	10%	5%
	Adult mortality	%	7%	3%
	Carcass (dressed) weight at sale - ox	Kg	220	400
	Carcass (dressed) weight at sale - cow	Kg	220	400
	Milk productivity	liters/head per day	1.7	3.0
	Lactation period	days	240	240
Stock	Calves	heads	3	11.5

	Weaners	heads	2	13
	Ox	heads	2	13
	Cows	heads	3	19
	Bulls	heads	0	2
	Total	heads	10	59
Off-take	Ox	heads	1	2
	Cows	heads	1	1
	Sales (beef meat)	Riel	14,520,000	39,600,000
Revenue	Sales (milk)	Riel	1,958,400	27,861,722
	Revenue	Riel	**16,478,400**	**67,461,722**
	Housing	Riel		
Investment costs	Other investments (feeder and waterer for cattle)	Riel		
	Investment costs	**Riel**	**0**	**0**
	Feed (lactating cows)	Riel	5,934,000	5,934,000
	Feed finishing (cows)	Riel	0	659,502
	Other feeding (calves)	Riel	5,934,000	5,934,000
	Treatment (dipping, spraying)	Riel	0	0
Operating costs	Slaughtering and movement fees & transport costs	Riel	174,500	174,500
	Vaccine and medicine for a cow	Riel	0	177,232
	Vaccine and medicine for a calf	Riel	0	69,940
	Miscellaneous	Riel	0	3,373,086
	Operating Costs	Riel	**12,042,500**	**16,322,260**
	Family labor	Riel	360,000	540,000
	Gross margin	Riel	4,435,900	51,139,462
	Net margin	Riel	4,075,900	50,599,462
	Net margin	$/year	1,001	12,429
	Incremental net margin	$/year	0	11,428
Profitability	FIRR	%	-	25%
	NPV @ 5.9%	Riel	-	174,597,999
	NPV @ 5.9%	$	-	42,888
	Returns to labor	Riel/day	44,359	340,930
	Returns to labor	$/day	10.90	83.75

Source: Author

Table A2.3. Model 2 - Pig Rearing

Assumptions and parameters		**Units**	**Details**	
Marketing	Selling price, sow	Riel/head	1,200,000	
	Selling price, boar	Riel/head	3,200,000	
	Selling price, adult for slaughtering	Riel/kg	8,500	
Labor	Family labor time	person months/cycle	3	
	Family labor cost	Riel/month	1,200,000	
Feeding	Feed costs - sow	Riel/head	280,000	
	Feed costs - pig fattening	Riel/head	500,000	
Animal husbandry	Veterinary costs		20,000	
Other costs	Miscellaneous expenditures, including AI	% of gross revenue	5%	
Years			WOP	WP
Other technical parameters	Piglet mortality	%	10%	5%
	Pig weight	kg	120	147
	Finishing pigs mortality	%	20%	12%
Stock (heads)	Piglets	heads	29	30
	Fattening pigs	heads	21	25
	Sows	heads	2	2
	Boars	heads	0	0
	Total	heads	31	29

Off-take (heads)	Sows	heads	0	2
	Boars	heads	0	1
	Pigs for slaughtering	heads	21	25
	Total	heads	21	28
Financial budget				
Revenue	Sales (live animals)	Riel	16,095,600	21,039,200
	Revenue	Riel	**16,095,600**	**21,039,200**
Investment costs	Animal purchase	Riel	**0**	
	Pig pens, feeders, and waterer cost	Riel	0	0
	Investment costs	Riel	0	**0**
Operating costs	Feed	Riel	9,972,000	12,936,000
	Animal health care	Riel	616,000	648,000
	Miscellaneous	Riel	804,780	1,051,960
	Operating Costs	Riel	**11,392,780**	**14,635,960**
Labor costs	Family labor	Riel	3,600,000	3,600,000
Profitability	Gross margin	Riel	4,702,820	6,403,240
	Net margin	Riel	1,102,820	2,803,240
	Net margin	$/cycle	271	689
	Incremental net margin	$/year	0	835
	FIRR	%	-	40%
	NPV @ 5.9%	Riel	-	30,651,202
	NPV @ 5.9%	$	-	7,529
	Returns to labor	Riel/day	39,190	53,360
	Returns to labor	$/day	9.63	13.11

Source: Author

Table A2.4. Model 3 - Local Chicken Production

Assumptions and parameters		Units	Details	
Marketing	Selling price, hen	Riel/head	25,000	
	Selling price, rooster	Riel/head	35,000	
	Selling price, broilers	Riel/head	15,000	
Labor	Family labor	person-days	30	
	Family labor	Riel/person day	3,600	
Feeding	Feed for hens and cocks	Riel/head	14,655	
	Feed for broilers	Riel/head	5,750	
	Feed for chicks	Riel/head	5,000	
Animal husbandry	Vaccine and medicine, hens and rooster	Riel/head	366	
	Vaccines and medicine for chicks	Riel/head	611	
Investments	Buying 20 hens and 3 cocks	Riel	936,330	
	Feeder	Riel	85,500	
	Waterer	Riel	49,000	
	Chicken pen	Riel	67,850	
Other costs	Miscellaneous expenditure	% of gross revenue	5%	6%
Years			WOP	WP
Other technical parameters	Chick mortality	%	25%	10%
	Broiler mortality	%	5%	2%
	Broiler weight	kg	1.9	3.5
	Hatched chicks per hen	heads	8	11
Stock	Chicks	heads	30	50
	Hens	heads	5	5
	Rooster	heads	1	1

	Total	heads	36	55
Financial budget				
Revenue	Sales (live animals)	Riel	1,190,000	1,866,875
	Revenue	Riel	**1,190,000**	**1,866,875**
Investment costs	Investment costs	Riel	**936,330**	**936,330**
Operating costs	Feed for hens and cocks	Riel	87,930	82,434
	Feed for chicks	Riel	75,000	247,500
	Animal health care	Riel	13,176	20,176
	Miscellaneous	Riel	59,500	112,013
	Operating Costs	Riel	**235,606**	**462,123**
Labor costs	Family labor	Riel	108,000	108,000
	Gross margin	Riel	**18,064**	**468,422**
Profitability	Net margin	Riel/Cycle	-89,936	1,441,690
	Net margin	$/cycle	-22	354
	Incremental net margin	$/year	0	1,505
	FIRR	%		40%
	NPV @ 5.9%	Riel		29,238,186
	NPV @ 5.9%	$		7,182
	Returns to labor	Riel/day	602	15,614
	Returns to labor	$/day	0.15	3.84

Source: Author

Table A2.5. Model 4 - Mung Bean Forage Production (Only WP)

Assumptions and parameters		**Unit**	**WP**
Unit quantities (inputs)	Seed rate	Kg/ha	30
	Fertilizer	Kg/ha	-
	Insecticides and weedicides	pack/ha	15
	Crop supplement	bottle/ha	-
	Water pumping	time/ha	-
			-
Labor	Land preparation/ripping	person-days/ha	10
	Land preparation/ridging	person-days/ha	-
	Sowing/planting	person-days/ha	15
	Fertilizer application	person-days/ha	10
	Pesticides application	person-days/ha	10
	Harvesting	person-days/ha	20
			-
Unit prices (input)	Seed, purchase price	Riel/Kg	10,000
	Fertilizer	Riel/Kg	-
	Insecticides and weedicides	Riel/liter	40,000
	Crop supplement	Riel/bottle	-
	Water pumping	Riel/time/ha	-
	Labor	Riel/person day	21,779
Amount	Seed	Riel/ha	300,000
	Fertilizer	Riel/ha	-

	Insecticides and weedicides	Riel/ha	600,000
	Crop supplement	Riel/ha	-
	Water pumping	Riel/ha	-
	Land preparation/ripping	Riel/ha	217,790
	Land preparation/ridging	Riel/ha	-
	Sowing/planting	Riel/ha	326,685
	Fertilizer application	Riel/ha	217,790
	Pesticides application	Riel/ha	217,790
	Harvesting	Riel/ha	435,580
Financial budget			
Cost summary	Input cost	Riel/ha	900,000
	Labor cost	Riel/ha	1,415,635
Output summary	Yield	Kg/ha, dry	1800
	Main product, selling price @ farm gate	Riel/Kg, dry	3,000
	Revenue	Riel/ha	5,400,000
Performance	Gross margin (before family labor) [cash flow]	Riel/ha	4,500,000
	Net margin (after family labor)	Riel/ha	3,084,365
	Net margin (after family labor)	$/ha	758
	Returns to family labor	Riel/person day	69,231
	Returns to family labor	$/day	17.01
	Incremental net margin	$/ha	247
	NPV @ 5.9%	Riel	14,339,017
	NPV @ 5.9%	$	3,522
	FIRR	%	69%

Source: Author

Table A2.6. Model 5 - Maize Production (Only WOP)

Assumptions and parameters		Unit	WOP
Unit quantities (inputs)	Seed rate	Kg/ha	20
	Fertilizer (urea)	Kg/ha	350
	Insecticides and weedicides	bottle/ha	-
	Crop supplement	bottle/ha	-
	Water pumping	time/ha	-
	Interest period	month	3
Labor	Land preparation/ripping	person-days/ha	0.0
	Land preparation/ridging	person-days/ha	10.0
	Sowing/planting	person-days/ha	8.0
	Fertilizer application	person-days/ha	8.0
	Pesticides application	person-days/ha	0.0
	Harvesting	person-days/ha	25.0
Unit prices (input)	Seed, purchase price	Riel/Kg	8,000
	Fertilizer	Riel/Kg	3,257
	Insecticides and weedicides	Riel/bottle	75,000
	Crop supplement	Riel/bottle	45,000
	Water pumping	Riel/time/ha	-
	Interest rate	% per month	-

	Labor	Riel/person day	3,600
Amount	Seed	Riel/ha	160,000
	Fertilizer	Riel/ha	1,139,880
	Insecticides and weedicides	Riel/ha	-
	Crop supplement	Riel/ha	-
	Water pumping	Riel/ha	-
	Land preparation/ripping	Riel/ha	-
	Land preparation/ridging	Riel/ha	36,000
	Sowing/planting	Riel/ha	28,800
	Fertilizer application	Riel/ha	28,800
	Pesticides application	Riel/ha	-
	Harvesting	Riel/ha	90,000
Cost summary	Land cost	Riel/ha	-
	Input cost	Riel/ha	1,299,880
	Labor cost	Riel/ha	183,600
	Interest (50% of total costs)	Riel/ha	-
Output summary	Yield	Kg/ha, wet	5,000
	Main product, selling price @ farm gate	Riel/Kg, wet	712
	Revenue	Riel/ha	3,562,125
Performance	Gross margin (before family labor) [cash flow]	Riel/ha	2,262,245
	Net margin (after family labor)	Riel/ha	2,078,645
	Net margin (after family labor)	$/ha	511
	Returns to family labor	Riel/person day	44,358
	Returns to family labor	$/person day	11
	NPV @ 5.9%	$/ha	482

Source: Author

12. **Results:** The results of the financial models - including performance indicators such as annual net margins, returns to labor, NPV, and Financial Internal Rate of Return (FIRR) as appropriate - are summarized in **Error! Reference source not found.**A2.7. The FIRRs are above the financial opportunity cost of capital, and the NPVs are positive, indicating that the adoption of improved livestock practices promoted by the project will allow farmer-beneficiaries to generate financially profitable results. The returns to labor in the WP scenario are higher than under the WOP scenario, indicating the convenience of converting stock management practices. The cash flow is always positive, but in the first years, because of the incidence of the investment costs, which are borne at the beginning of the activity, the capacity of the management/production model is indicated to repay the costs of the investments.

Table A2.7. Financial Analysis Results Summary

Models	Without Project (WoP)		With Project (WP) - At full maturity of the investment			
	Return to family labor	Net margin	Return to family labor ($/day)	Net margin	NPV @ 8%	FIRR
	$/day	$/year	$/day	$/year	$	%
Cattle	10.90	1,001	10.42	1,430	42,888	25%
Pig	9.63	542	13.11	1,671	53,360	40%
Local chicken	0.15	(66)	3.84	1,505	7,182	40%
Maize	10.90	511	-	-	-	-
Forage	-	-	17.01	758	3,522	69%

Source: Author

13. **Exchange rate and the opportunity cost of capital.** The official exchange rate (OER) of 4,071 KHR/USD is used (February 2024). The financial interest rate provides alternative financial returns/opportunity costs to the investor. It is used here to assess the investments' viability and robustness compared to market alternatives. The financial discount rate

is estimated at 5.9 percent, computed as the simple average between official deposit and lending interest rates (see Table **A2.8.** A2.8). Such a rate is used to estimate the production models' financial NPV.

Table A2.8. Financial Opportunity Cost of Capital

Indicator	Deposit Interest Rate	Lending Interest Rate	Average
Rate (%)	1.5%	10.3%	5.9%

Source: International Monetary Fund, International Financial Statistics and World Bank data

Economic Analysis

14. **Objectives:** The economic analysis objectives are to (i) determine the economic viability and overall cost-effectiveness of the project, estimated from the perspective of the society rather than the individuals, through the comparison of aggregated economic benefits with project economic costs and the assessment of the economic internal rate of return (EIRR); and (ii) perform sensitivity analysis to measure the robustness of the proposed investments and to measure variations in the overall EIRR due to risk and unforeseen factors, including climatic events. Details of the economic analysis can be found in the companion Excel worksheets.

15. **Methodology and assumptions:** The economic analysis is conducted over a 20-year period, including the 5-year implementation period of the proposed project. It is based on the estimation of the benefits gained from the increased economic performance of the HHs targeted. The main quantifiable economic benefits from the project are represented by the net incremental benefits computed in the financial analysis, i.e., the difference between the annual net margins in the WOP and WP scenarios. Such benefits are subsequently aggregated over the total number of household beneficiaries, thereby determining the total benefits generated by the project due to switching from WOP to WP scenario.

16. **The net incremental benefits were calculated for each project year and cumulated over 20 years.** They were compared with the total project costs (for the years 1 to 5) and with the management costs (for the years 6 to 20), which will have to be incurred if the future benefits of the investment are to be sustained. The analysis is based on 2023 constant prices and a discount rate of 5 percent is assumed. The Cambodian Khmer Riel is used as the unit of account, and the OER of KHR 4,071 to US$1 (February 2024) was applied when converting to U.S. dollars.

17. **For the economic analysis, economic prices instead of financial ones are used.** The financial total project costs and the financial prices of tradable goods in the financial models are converted into economic values using a Standard Conversion factor (SCF) computed as shown in Table A2.4. Family labor has been valued at its opportunity cost.

Table A2.9. SCF Computation for the Economic Analysis

Variable	Rate	M current $	Source of data
1) total imports (M)		16,180	WB, 2022
2) total exports (X)		20,160	WB, 2022
3) import taxes (Tm)		2,896.2	WTO, 2022
4) export taxes (Tx)		5,040.00	WTO, 2022
SER	4,326.2		SER=(M+X)/[(M+Tm)+(X-Tx)]*OER
OER	4,071.0		
SCF	1.063		SCF=SER/OER
VAT	0.100		
SCF	0.956		SCF with VAT of 10% also applied to all tradable goods

Source: Author

18. **However, for some key traded goods, import/export parity prices at the farm gate have been computed with reference to international border prices, applying conversion factors for each category of costs and eliminating taxes and transfers.** Specifically, import parity prices are computed for fertilizers (urea, phosphate, and potassium chloride),

which are among key imported items, starting from the international Free on Board (FOB) prices at the nearest port and considering tariffs and taxes, marketing charges, and transportation costs. Details are shown in A2.10. Export parity price is computed for pig meat (chosen as a reference for exporting livestock products) and used to estimate the economic price of exportable outputs. Details are shown in Table A2.11.

Table A2.10. Import Parity Price for Key Importable Inputs

Commodity	Unit	Urea 1/		Phosphate 1/		Potassium Chloride	
		Financial	Economic	Financial	Economic	Financial	Economic
Price FOB, Annual average, 2023	$/mt	358	358	322	322	383	383
Plus:							
- Transport, insurance, and freight	$/mt	76	76	76	76	76	76
- Marketing Charges (2.5%)	$/mt	9	9	8	8	10	10
Border CIF price	$/mt	443	443	405	405	468	468
Riel equivalent	Riel/mt	1,801,733	1,914,685	1,650,261	1,753,717	1,906,887	2,026,431
- VAT (10%)	Riel/mt	180,173	-	214,534		247,895	
- Marketing Charges (2.5%)	Riel/mt	45,043	47,867	41,257	43,843	47,672	50,661
-Import tariff (17.9%)	Riel/mt	322,510	-	295,397		341,333	
Wholesale border price	Riel/mt	2,026,950	1,962,552	1,906,052	1,797,560	2,202,454	2,077,092
- Transport to regional market 2/	Riel/mt	74,800	74,800	74,800	74,800	74,800	74,800
- Transport to farmgate 3/	Riel/mt	18,700	18,700	18,700	18,700	18,700	18,700
- Marketing charges (2.5%)	Riel/mt	50,674	49,064	47,651	44,939	55,061	51,927
Farm Gate Import Price	Riel/mt	2,171,123	2,105,116	2,047,203	1,935,999	2,351,016	2,222,519
Farm Gate Import Price	Riel/kg	2,171	2,105	2,047	1,936	2,351	2,223
% of nutrients in product	%	0.46	0.46	0.45	0.45	0.60	0.60
Input subsidy (0%)	Riel/kg	-	-	-		-	
Farm gate market price	Riel/kg	4,720	4,576	4,549	4,302	3,918	3,704
Conversion Factor		0.97		0.95		0.95	

1/ Urea: E.Europe; Phosphate: rock
2/ 400 km @ $ 0.046 $ per ton/Km = 187 Riel per ton/Km
3/ 100 km @ 187 Riel per ton/Km
Source of data: World Bank Commodities Price Data (The Pink Sheet), March 2024

Source: Author's elaboration based on World Bank Commodities Price Data (The Pink Sheet), accessed in March 2024

Table A2.11. Export Parity Price for Exported Outputs

Commodity	Unit	Pig Meat	
		Financial	Economic
FOB price at the border	$/mt	2,870	2,870
Maritime Fret	$/mt	50	50
International Insurance (2% of FOB price)	$/mt	57	57
Exchange rate	Riel/$	4,071.0	4,326.2
CIF price at port of departure	Riel/mt	11,450,095	12,167,907
Export duties (25% of CIF)	Riel	2,862,524	3,041,977
Handling (2.5% of CIF)	Riel	286,252	286,252
Storage fee (1% of CIF and duties)	Riel	143,126	152,099
Port fee (50 % of the storage fee and handling fee)	Riel	214,689	219,176
Transportation cost from farm to port	Riel/mt	1,717,514	1,717,514
Price at the farm gate	Riel/mt	6,225,989	6,750,890
Price at the farm gate	Riel/Kg	6,226	6,751
Conversion Factor		1.08	

Source: Author's elaboration based on Eurostat/Market Access Database, accessed in March 2024

19. **Direct project beneficiaries and benefits flow**: The project's direct beneficiaries will total 30,000 households involved in livestock production (8,000 cattle herders, 6,000 pig farmers, and 16,000 chicken farmers) in the three provinces of Battambang, Tbong Khmum, and Kampong Speu. Also, it is assumed that about 25 percent of the cattle farmers, i.e., 2,000 households, will produce forage for animal feed. The project will also provide other indirect benefits outside the target areas through replicating the technology models implemented.

20. **In line with the conservative approach followed in this analysis, it is assumed that not all the target beneficiaries will adopt the proposed improved technologies and implement the proposed investments.** The adoption rate is expected to reach 70 percent of the target beneficiaries at the project's end, corresponding to about 22,400 households adopting the proposed innovations, including growing forage. The incremental targets and adoption rates are shown in Table A2.12.

Table A2.12. Number of HH Adopters of Cropland Management Practices

Model	Y1	Y2	Y3	Y4	Y5	Total
Cattle	-	1,120	1,680	1,680	1,120	5,600
Pig	-	840	1,260	1,260	840	4,200
Local chicken	-	2,240	3,360	3,360	2,240	11,200
Mung bean forage	-	280	420	420	280	1,400
Total	-	4,480	6,720	6,720	4,480	22,400

Source: Author

21. **Impact on employment**: Agricultural employment (family and hired labor) on the benefiting farms is expected to rise from around 2.3 million to 2.6 million person-days per year at full development. This is equivalent to around 1,250 additional full-time jobs (at 240 person-days per year). For households with limited availability of family labor, it is expected that there is sufficient hired labor available, particularly among the landless poor who are mainly employed in agriculture as wage workers and who would thereby benefit from significant employment opportunities. In addition, it can be expected that substantial employment will also be generated to handle incremental production, processing, and marketing.

22. **Economic project costs**: Total project financial costs of 20 million US$ invested over 5 years are derived from the budget. They are transformed into economic costs using the SCF computed above. A total economic cost of 19.18 million US$ is used in the analysis. No investment costs were considered necessary after Year 5. Operating costs were included from years 6 to 20, as it is assumed that these costs will have to be incurred if the project's benefits are to be sustained. Only the incremental economic costs of the project are considered, i.e., the costs of activities funded by the project, to avoid double counting costs. Costs already included in the estimation of the net incremental benefits of the individual project activities models (e.g., costs directly borne by farmers engaging in the proposed activities or the project and accounted for in the financial/economic models) have been excluded as they are incorporated in the aggregation of the models.

23. **Computation of net present value (NPV) and economic internal rate of return (EIRR):** The expected EIRR is computed to illustrate the need for funding and the overall cost-effectiveness of the project. The overall EIRR of the project is estimated at 23.5 percent (base case), which is well above the opportunity cost of capital in Cambodia (5.9 percent; see Table **A2.8.** 7), confirming the economic justification of the project. Given that the adoption rate at the end of the project is assumed to be only 70% of target HHs, in case of higher adoption rates, the EIRR will increase further. In addition to this, the analysis only considered the economic benefits at the farm gate. The indirect benefits to upstream and downstream actors in the value chain from increased trade volumes, quality, and value-adding opportunities beyond those mentioned above have not been considered due to estimation difficulties. The economic NPV is estimated at US$238.2

million over the 20 years of the analysis, with the benefit stream based on the quantified benefits as specified above. The discount rate adopted in the economic analysis is 5%, as discussed above.

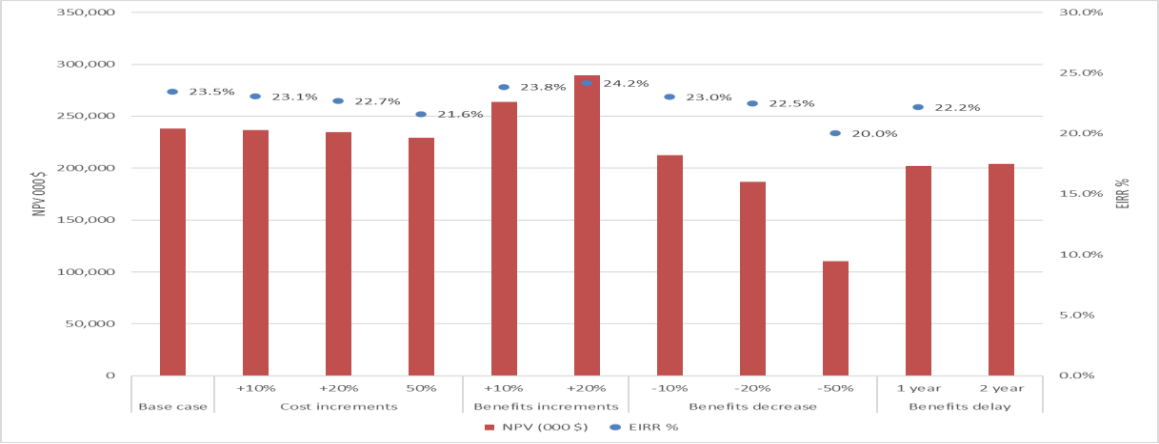
24. **Sensitivity analysis:** A sensitivity analysis was carried out to measure variations due to unforeseen factors and relevant risks to test the robustness of the above results. The following scenarios are simulated: 10, 20, and 50 percent cost overrun, benefits increment, benefits decrease, and 1 and 2 years of benefits delays. Results are presented in Table A2.13 and Figure A2.1. The proposed project is solid from an economic standpoint since it is profitable under all simulated changes.

Table A2.13. Economic and Sensitivity Analysis Summary

Project performance indicators	Base case	Cost increments			Benefits increments		Benefits decrease			Benefits delay	
		+10%	+20%	50%	+10%	+20%	-10%	-20%	-50%	1 year	2 years
EIRR %	23.5%	23.1%	22.7%	21.6%	23.8%	24.2%	23.0%	22.5%	20.0%	22.2%	22.4%
NPV (000 $)	238,180	236,390	234,599	229,228	263,789	289,397	212,572	186,963	110,137	202,134	204,274

Source: Author

Figure A2.1. Economic and Sensitivity Analysis Results



Source: Author

25. **Mitigation benefits** As presented in the GHG analysis reported in Annex 3, the project is found to be a net GHG source. Indeed, the net carbon balance consequent to CILVCOHP implementation is positive, indicating that project activities will be a net source of emissions at a level of 14,009 tCO_2e per year. The economic analysis incorporates the expected increased emissions (to the baseline) in the form of negative externalities of project interventions. Both profitability indicators, EIRR and NPV, have been re-calculated considering the contribution of the climate co-benefits. Different scenarios of shadow prices of carbon can be used. In this analysis, both a low and high shadow price of carbon scenarios are used.[26] Under the low shadow price of carbon scenario, GHG mitigation benefits are valued at US$44 per tCO_2e (starting in 2024 with average annual increases of 2.25 percent, reaching US$66 per tCO_2e in the year 2043). Under the high shadow price of carbon scenario, GHG mitigation benefits are valued at US$87 per tCO_2e (in 2024), reaching US$134 per tCO_2e in 2043.

26. **When the economic value of mitigation benefits is added, the project's economic viability decreases, as shown in**

[26] Based on: World Bank. 2017. Guidance Note on Shadow Price of Carbon in Economic Analysis.

Table A2.14. However, the project will remain viable under both low and high carbon prices: NPVs are positive, and IRRs are above the opportunity cost of capital.

Table A2.14. Economic Analysis Results, Including GHG Mitigation Benefits

a. Low carbon price	EIRR	22.3%
	NPV (000 $)	228,977
b. High carbon price	EIRR	21.3%
	NPV (000 $)	219,815

Source: Author

ANNEX 3. GHG Accounting Analysis

COUNTRY: Kingdom of Cambodia
Cambodia Inclusive Livestock Value Chains Project

1. **Corporate mandate:** The World Bank has adopted, in its 2012 Environment Strategy, a corporate mandate to conduct GHG emissions accounting for investment lending in relevant sectors. The ex-ante quantification of GHG emissions is an important step in managing and ultimately reducing GHG emissions, and it is becoming a common practice for many international financial institutions. Such emissions are global environmental benefits or costs that are externalities-related and public.

2. **Methodology:** To estimate the impact of agricultural investment lending on GHG emission reduction and carbon sequestration, the World Bank has adopted the Ex-Ante Carbon-balance Tool (EX-ACT)[27] that allows the ex-ante assessment of a project's net carbon balance, defined as the net balance of CO_2 equivalent (CO_2e) GHG emitted or sequestered as a result of project implementation (WP case) compared to a WOP scenario and which is selected as an indicator of the mitigation potential of the project. EX-ACT estimates the carbon stock changes (emissions or sinks), expressed in equivalent tons of CO_2 per hectare and year.[28] The primary data sources were MAFF and WB.

3. **Project boundary and key assumptions:** The project area has a tropical moist climate. The dominant soil type is low-activity clay soil. The project implementation phase is 5 years of actual implementation, and the capitalization phase is assumed to be 15 years, resulting in a 20-year implementation period, which is common in the use of EX-ACT and aligned with the project period for the Economic and Financial Analysis (EFA). The analysis further assumes the dynamics of change to be linear throughout the project. Data used to describe climate patterns and soil characteristics cannot consider the variability of existing soil and climatic conditions, and the results of the analysis should, therefore, be considered only as an average for the whole potential investment area. Assumptions adopted are very conservative to not overestimate the potential expected benefits. They are also aligned with the assumptions used as the basis for the EFA.

4. **Changes in cropland management:** It is assumed that, under the WP scenario, 25 percent of target farmers rearing cattle will convert 0.25 ha of cropland from rainfed maize (chosen as a representative crop) to forage production (mung bean forage is chosen as a representative crop) to improve animal feeding. Starting from the total 8,000 cattle rearing households, 2,000 of them will convert 0.25 ha/HH of cropland (corresponding to a total of 500 ha) from maize conventional farming (full tillage, low C input, burned residues) to improved forage cropping (reduced tillage, high C input with manure, residues exported for animal feeding). Table A3.1 presents the data used to simulate the changes in cropland management in the current analysis.

Table A3.1. Changes in Cropland Management

Crop	Area (ha)		
	Start	WOP	WP
Maize	500	500	0
Mung bean	0	0	500

Source: Author

[27] M. Bernoux, G. Branca, A. Carro, L. Lipper, G. Smith, L. Bockel. Ex-ante greenhouse gas balance of agriculture and forestry development programs. Sci. Agric., 67 (1) (2010), pp. 31–40
[28] See more here: http://www.fao.org/tc/exact/carbon-balance-tool-ex-act/en/

5. **Changes in livestock management:** Improved livestock practices and manure management promoted by the project are considered in the 'Livestock and manure management' sub-module. The analysis considers four systems: dairy cattle (milk production), other cattle (meat production), local chicken production, and pig rearing. The 'low productivity' set of emission coefficients is adopted, given that the target livestock system is at the level of smallholders. The number of heads the project targets is used for accounting for the different species.

6. **In the WP scenario, farmers will adopt improved animal management practices**: (i) the number of heads will increase following the new dynamic of the stock evolution guided by the enhanced technical coefficients (e.g., mortality rates); (ii) the quantity of meat produced will increase due to the augmented unitary weight of the animals consequent to the better management conditions.

7. **The number of heads In the WOP scenario is forecasted based on the historical trend estimated considering livestock inventory data reported in Table 1 (Evolution of livestock numbers between 2016 and 2023).** Table A3.2 summarizes the relevant data used to simulate the impact of changes in livestock management.

Table A3.2. Changes in livestock management

Number of heads	Start	WOP	% change	WP	% change
Beef cattle	80,000	92,964	16%	94,750	18%
Chicken broiler	1,200,000	1,520,308	27%	2,015,040	68%
Growing swine	252,480	275,491	9%	311,582	23%
Tons of product per year	**Start**	**WOP**		**WP**	
Beef	17,600	20,452	16%	28,425	62%
Chicken broiler	2,280	2,889	27%	7,053	209%
Pig	30,298	33,059	9%	45,803	51%

Source: Author

8. **Changes in the use of inputs**: It is assumed that, due to the conversion of land from maize to forage production, fertilizers will be reduced. This is accounted for in the 'inputs' module through a reduction of about 175 tons of urea per year (computed using a rate of 350 kg/ha of urea and a surface of 500 ha). Also, it is assumed that improved livestock production under the WP scenario will cause an increase in the quantity of feed required for cattle (partially compensated by the self-production of forage indicated above), pig rearing, and indigenous chicken production. The corresponding tones of feeds are computed considering the average unit feed requirements (Kg/head per year) and the number of heads the project targets. The project (Subcomponent 2.1) will build some value chain infrastructure on a pilot basis. In this analysis, we consider that the project will build 10 2,500 square-meter slaughterhouses, in line with the average size of slaughterhouses in the rural areas of the country.[29] Regarding energy-related aspects, it is assumed that such infrastructure will incorporate energy efficiency measures. Table A3.3 presents the assumptions regarding changes in the use of inputs, including energy.

Table A3.3. Changes in the Use of Inputs

a) Annual agricultural inputs in tons			
	Start	**WOP**	**WP**
Urea (N)	175	175	-
Compost (N)	-	-	-
Phosphorus (P2O5)	-	-	-
Potassium (K2O)	-	-	-

[29] E.g., see Borin, Khieu. (2020). Pig Value Chain Study on Disease Transmission in Cambodia.

Herbicides	-	-	-
Insecticides	-	-	-
Fungicides	-	-	-
Animal feed	397,792	557,442	812,930

b) Construction

Construction	Details	Area per building (sq. mt)	no.	Total (sq. mt)
Slaughterhouses	Agricultural buildings (concrete)	2,500	10	25,000

c) Energy consumption

	Kw per sq. mt per year	MWh per year each	nr	total Mwh
Slaughterhouses	150	375	10	3,750

Source: Author

9. **Results.** The analysis performed here computes the net carbon balance which quantifies GHGs emitted or sequestered because of the project (WP scenario) compared to the business-as-usual (BAU) practices (WOP scenario). A negative net carbon balance would indicate that the project is a Carbon sink, while a positive balance would indicate that the project is a net source of GHG emissions.

10. **The analytical results (Tables A3.5 and A3.6) show that implementation of the project will generate a positive carbon balance of about 0.3 million tCO_2e with respect to the WOP (business-as-usual) scenario, over the accounting period of 20 years.** Thus, the project will be a net GHG source of 14,009 tCO_2e per year, of which the majority (11,808 tCO_2e/year) will come from the augmented number of animals. The construction of value chain infrastructure contributes with 3,831 tCO_2e/year of net emissions. The introduction of forage production will reduce the annual net emissions by 1,629 tCO_2e/year, providing a relatively small mitigation contribution (sink).

11. **However, despite the overall increase in the GHG net emissions, the project is mitigating climate change through an increase in livestock production efficiency.** This is shown in Table A3.4. The productivity enhancements achieved through project activities are expected to reduce the emissions intensity of livestock production (i.e. diminishing unit GHG emissions, e.g., per animal head or ton of meat product). Indeed, improved feed can reduce methane emissions from enteric fermentation, while enhanced animal health conditions can enhance productivity, therefore reducing unit emissions. Thanks to the project, unit annual emissions per head are expected to decrease by 18% (from 0.13 to 0.10 tCO_2e/head), and the unit annual emissions per ton of meat produced by 35% (from 4.79 to 3.10 tCO_2e/t meat). Also, while the Project would result in a higher increase in the number of animals with respect to the baseline than under the WOP case (58% vs. 23%), the corresponding emissions are found to increase less than proportionally (29% vs. 23%) resulting in an emission reduction rate by 41%. Consequently, the project will be able to offset the increase in the emissions driven by the bigger size of the herds under the WP scenario by 12,319 tCO_2e/year - computed by multiplying the increased number of animals WP vs WOP by the decreased unit emissions WOP vs WP, which represents 104% of the increase in the emissions caused by the Project.

Table A3.4. GHG Efficiency of Livestock Production, Without- and With Project Scenarios

Parameters	Unit of measure	Baseline	2030, BAU (WOP scenario)	2030, Project Implementation Completion (WP scenario)
Total number of animals	Nr. Heads	1,532,480	1,888,764	2,421,372
Total Emissions from livestock	tCO2e/year	195,122	240,485	252,293

Increased emissions, WP vs WOP	tCO2e/year			11,808
Increased number of animals, with respect to the baseline	%	-	23%	58%
Increased emissions, with respect to the baseline	%	-	23%	29%
Emission reduction rate, WP vs. WOP	%	-	-	-49%
Unit annual emissions from live animals	tCO2e/head per year	-	0.13	0.10
Unit annual emissions per product (meat)	tCO2e/t meat	-	4.79	3.10
Emission offsets, WP vs. WOP	tCO2e/year	-	-	12,319
Emission offsets, WP vs. WOP	%	-	-	104%

Source: Author's elaborations

12. **In summary, the project increases GHG emissions with respect to the baseline since it expands the animal stock of smallholders more than und the WOP scenario, and builds value chain infrastructures.** However, it provides mitigation benefits in the form of reduced emissions intensity (unit emissions) and increased production efficiency. Such increased efficiency of production can offset the increased emissions since the higher number will emit relatively less emissions in the WP scenario than under the WOP case. This represents a successful model of production as it can progressively reduce overall emissions, if scaled-up nationwide. Table A3.5 shows summary results. The detailed results are reported in Table A3.6.

13. **The EX-ACT file with the detailed analysis is also made available as a companion to the present report.**

Table A3.5. Ex-ACT Summary Results

Summary GHG analysis

CILVCOHP

Continent	South-eastern Asia
Country	Cambodia
Climate	Tropical
Moisture	Moist
Total area (ha)	500

Project duration (in years)

Implementation Phase	5
Capitalization Phase	15
Total Duration of Accounting	20

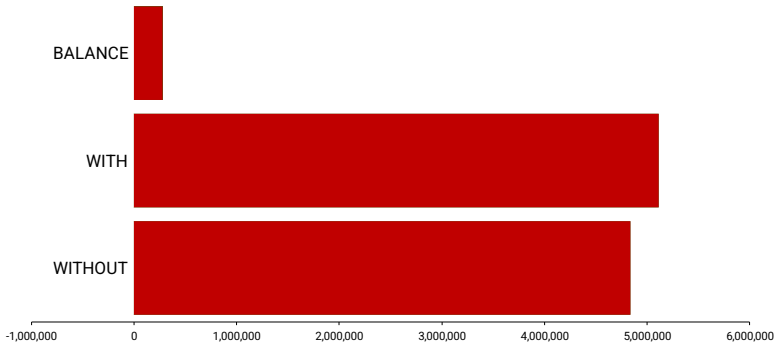
MITIGATION POTENTIAL

280,184

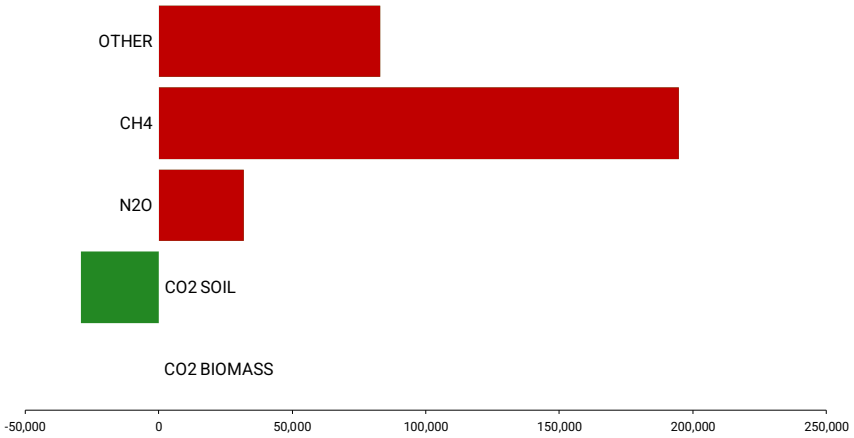
tCO_2-e

+ = Source / - = Sink

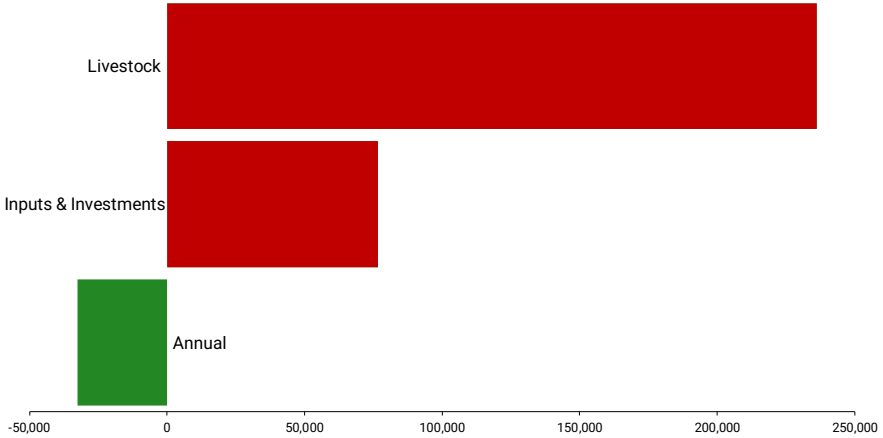
Net fluxes, in tCO2-e



Share of the balance per GHG, in tCO2-e



Carbon-balance, in tCO2-e



Source: Author's elaborations using Ex-Act software

Table A3.6. Ex-ACT Detailed Results

DETAILED RESULTS

Project name	CILVCOHP
Continent	South-eastern Asia
Country	Cambodia
Climate	Tropical
Moisture	Moist

Project duration (in years)	
Implementation Phase	5
Capitalization Phase	15
Total Duration of Accounting	20

Total area (ha)	500
Mineral soil	500
Organic soil	0
Waterbodies	0

Global warming potential	
CO_2	1
CH_4	28
N_2O	265

GROSS FLUXES

In tCO2-e over the whole period analysis

PROJECT COMPONENTS		WITHOUT	WITH	BALANCE
Land use changes	Deforestation	0	0	0
	Afforestation	0	0	0
	Other land-use	0	0	0
Cropland	Annual	8,464	-24,118	-32,583
	Perennial	0	0	0
	Flooded rice	0	0	0
Grasslands & Livestock	Grasslands	0	0	0
	Livestock	4,809,708	5,045,861	236,153
	Forest mngt.	0	0	0
	Inland wetlands	0	0	0
	Coastal wetlands	0	0	0
	Fisheries and aquaculture	0	0	0
	Inputs & Invest.	17,505	94,119	76,614
Total emissions, tCO2-e		**4,835,677**	**5,115,862**	**280,184**
Total emissions, tCO2-e/ha		**9,671.4**	**10,231.7**	**560.4**
Total emissions, tCO2-e/ha/yr		**483.6**	**511.6**	**28.0**

+ = Source / - = Sink

Results presented here include GHG fluxes on mineral and organic soils

See further down for detailed results on organic soils

* Includes fisheries, acquaculture and inputs & investments that are not included in the AFOLU definition.

SHARE PER GHG OF THE BALANCE

Tier 2 Specific GHG fluxes

In tCO2-e over the whole period analysis

CO2 BIOMASS	CO2 SOIL	N_2O	CH_4	ALL NON-AFOLU EMISSIONS*
0	0	0	0	
0	0	0	0	
0	0	0	0	
0	-29,224	-865	-2,494	
0	0	0	0	
0	0	0	0	
0	0	0	0	
		38,828	197,324	
0	0	0	0	
0	0	0	0	
0	0	0	0	
0	0	0	0	0
	0	-6,253		82,868
0	**-29,224**	**31,710**	**194,830**	**82,868**
0.0	**-58.4**	**63.4**	**389.7**	**165.7**
0.0	**-2.9**	**3.2**	**19.5**	**8.3**

AVERAGE ANNUAL EMISSIONS

Tier 2 Annual emissions

In tCO2-e/yr

WITHOUT	WITH	BALANCE
0	0	0
0	0	0
0	0	0
423	-1,206	-1,629
0	0	0
0	0	0
0	0	0
240,485	252,293	11,808
0	0	0
0	0	0
0	0	0
0	0	0
875	4,706	3,831
241,784	**255,793**	**14,009**

Uncertainty level	tCO2-e/yr	Percent
WITHOUT	241,784	33%
WITH	255,793	33%
BALANCE	14,009	34%

Source: Author's elaborations using Ex-Act software

ANNEX 4. Team List

COUNTRY: Kingdom of Cambodia

Cambodia Inclusive Livestock Value Chains Project

Name	Role	Title	Specialization	Unit
Mudita CHAMROEUN	Task Team Leader (ADM Responsible)	Senior Rural Development Specialist	Agronomist, Rural Development Management	SEAAG
Sereyvattana CHAN	Procurement (ADM Responsible)	Procurement Specialist	Procurement	EEAR1
Cung Van PHAM	FM (ADM Responsible)	Senior FM Specialist	Financial Management	EEAG2
Sarah Antwi BOASIAKO	Social (ADM Responsible)	Senior Social Development Specialist	Social	SEAS1
Kate Almora PHILP	Environment (ADM Responsible)	Environmental Engineer	Environment	SEAE2
Andreas Groetschel	Team Member	Agriculture Economist, M&E	EFA, M&E, RFM	FAOCP/WB
Chenda SEM	Team Member	Social Development Specialist	Gender	SEAS1
Giacomo BRANCA	Team Member	EFA, GHG, Climate Co-benefit	EFA, GHG, Climate Co-Benefit	FAOCP/WB
Kimsun TONG	Extended Team Member	Economist	Poverty	EEAPV
Kuenga NAMGAY	Team Member	Livestock Expert	Livestock	FAOCP/WB
Lyden KONG	Team Member	Operations Support Consultant	PIM, Operations	SEAAG
Marong CHEA	Team Member	Technical Consultant	PIM, Agribusiness	SEAAG
Navy NOP	Team Member	Natural Resources Management Specialist	Environment	SEAE2
Nkulumo ZINYENGERE	Team Member	Agriculture Economist	Corporate, GHG, EFA, RFM	SCCFM
Reaksmey Keo Sok	Team Member	Technical Consultant	PIM	SEAAG
Saroeun BOU	Team Member	External Affairs Officer	Communication	ECREA
Sodeth LY	Extended Team Member	Senior Economist	Macro Economy	EEAM1
Sokbunthoeun SO	Extended Team Member	Senior Public Sector Specialist	Public Governance	EEAG1
Sophy EA	Team Member	Senior Environmental Specialist	Environment	SEAE2
Vitra TEK	Team Member	Program Assistant	Administrative and Logistics	EACSF

ANNEX 5. Map IBRD 47428/March 4, 2025

COUNTRY: Kingdom of Cambodia
Cambodia Inclusive Livestock Value Chains Project