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Report No: PAD00032

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

# PROGRAM APPRAISAL DOCUMENT

ON A

PROPOSED LOAN

IN THE AMOUNT OF EURO 186.5 MILLION
(US$200.0 MILLION EQUIVALENT)

TO THE

PEOPLE'S REPUBLIC OF CHINA

FOR A

SUSTAINABLE FODDER PRODUCTION AND LOW METHANE LIVESTOCK DEVELOPMENT PROGRAM-FOR-RESULTS (P181021)

JUNE 6, 2024

Agriculture and Food
East Asia And Pacific

CURRENCY EQUIVALENTS

(Exchange Rate Effective April 30, 2024)

| | |
|---|---|
| Currency Unit = | Chinese Renminbi (CNY) |
| CNY 7.24 = | US$ 1.0 |
| US$ 1.0 = | EUR 0.93 |

FISCAL YEAR
January 1 - December 31

| | |
|---|---|
| Regional Vice President: | Manuela V. Ferro |
| Regional Director: | Anna Wellenstein |
| Country Director: | Mara K. Warwick |
| Practice Manager: | Paavo Eliste, Ann Jeannette Glauber |
| Task Team Leader(s): | Sandra Broka, Rajesh Koirala, Wendao Cao |

ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| AM | Accountability Mechanism |
| AMR | Antimicrobial Resistance |
| BAU | Business as Usual |
| CCB | Climate Co-Benefits |
| CCDR | Country Climate and Development Report |
| CPF | Country Partnership Framework |
| CPMO | County-Level Project Management Office |
| CSA | Climate-Smart Agriculture |
| CSFPTP | Climate-Smart Fodder Production Technologies and Practices |
| DARA | Department of Agriculture and Rural Affairs |
| DEE | Department of Ecology and Environment |
| DLI | Disbursement-Linked Indicator |
| DLR | Disbursement-Linked Result |
| E&S | Environmental and Social |
| EFA | Economic and Financial Analysis |
| ERR | Economic Rate of Return |
| ESSA | Environmental and Social Systems Assessment |
| F&C | Fraud and Corruption |
| FAO | Food and Agriculture Organization |
| FM | Financial Management |
| FMD | Foot-and-Mouth Disease |
| FSA | Fiduciary Systems Assessment |
| FYP | Five-Year Plan |
| GDP | Gross Domestic Product |
| GHG | Greenhouse Gas |
| GPBR | General Public Budget Revenue |
| GPG | Global Public Good |
| GRS | Grievance Redress Service |
| ICR | Implementation Completion and Results Report |
| IPCC | International Panel on Climate Change |
| JEG | Joint Expert Group |
| LETP | Low Emission Technology and Practice |
| M&E | Monitoring and Evaluation |
| MARA | Ministry of Agriculture and Rural Affairs |
| MFD | Maximizing Finance for Development |
| MRV | Measurement, Reporting, and Verification |
| MTR | Midterm Review |
| NDC | Nationally Determined Contribution |
| NSADP | National Sustainable Agricultural Development Plan |
| OHS | Occupational Health and Safety |

| | |
|---|---|
| PA | Paris Alignment |
| PAD | Program Appraisal Document |
| PAP | Program Action Plan |
| PDO | Program Development Objective |
| PforR | Program-for-Results |
| PGGP | People's Government of Gansu Province |
| PIP | Program Implementation Plan |
| PMO | Program Management Office |
| PPMO | Provincial Program Management Office |
| PPR | *Peste des Petits Ruminants* (a viral disease which affects goats, sheep, and other animals) |
| PSC | Program Steering Committee |
| RA | Results Area |
| TLPE | Target Livestock Production Entities |
| TOR | Terms of Reference |
| UA | Universally Aligned |
| VE | Verification Entity |
| WBG | World Bank Group |

**TABLE OF CONTENTS**

**DATASHEET**

## BASIC INFORMATION

| Project Beneficiary(ies) | Operation Name | | |
|---|---|---|---|
| China | Sustainable Fodder Production and Low Methane Livestock Development Program-for-Results | | |
| Operation ID | Financing Instrument | Does this operation have an IPF component? | |
| P181021 | Program-for-Results Financing (PforR) | No | |

### Financing & Implementation Modalities

| | |
|---|---|
| [ ] Multiphase Programmatic Approach (MPA) | [ ] Fragile State(s) |
| [ ] Contingent Emergency Response Component (CERC) | [ ] Fragile within a non-fragile Country |
| [ ] Small State(s) | [ ] Conflict |
| [ ] Alternative Procurement Arrangements (APA) | [ ] Responding to Natural or Man-made Disaster |
| [ ] Hands-on Expanded Implementation Support (HEIS) | |

| Expected Approval Date | Expected Closing Date |
|---|---|
| 27-Jun-2024 | 31-Dec-2030 |
| Bank/IFC Collaboration | |
| No | |

### Proposed Program Development Objective(s)

The Program Development Objective is to improve productivity and lower methane emissions in selected livestock sub-sectors and enhance the governance system for greening the livestock sector in the Program Counties of Gansu Province.

## Organizations


| | |
|---|---|
| Borrower: | People's Republic of China |
| Implementing Agency: | Gansu Provincial Department of Agriculture and Rural Affairs |
| Contact: | Dongqing Zhao |
| Title: | Director of Foreign Investment Management Office |
| Telephone No: | 008613993115944 |
| Email: | gszdq@163.com |


## COST & FINANCING (US$, Millions)

### Maximizing Finance for Development

| | |
|---|---|
| **Is this an MFD-Enabling Project (MFD-EP)?** | Yes |
| **Is this project Private Capital Enabling (PCE)?** | No |

### SUMMARY

| | |
|---|---|
| **Government program Cost** | **824.80** |
| **Total Operation Cost** | **824.80** |
| Total Program Cost | 824.30 |
| Other Costs (Front-end fee,IBRD) | 0.50 |
| **Total Financing** | **824.80** |
| **Financing Gap** | **0.00** |

### Financing (US$, Millions)

| | |
|---|---|
| **World Bank Group Financing** | |
| International Bank for Reconstruction and Development (IBRD) | 200.00 |
| **Non-World Bank Group Financing** | |
| Counterpart Funding | 624.80 |
| Local Govts. (Prov., District, City) of Borrowing Country | 624.80 |

**Expected Disbursements (US$, Millions)**

| WB Fiscal Year | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 |
|---|---|---|---|---|---|---|---|---|
| Annual | 0.00 | 12.00 | 16.90 | 46.20 | 47.50 | 48.50 | 25.00 | 3.90 |
| Cumulative | 0.00 | 12.00 | 28.90 | 75.10 | 122.60 | 171.10 | 196.10 | 200.00 |

## PRACTICE AREA(S)

**Practice Area (Lead)**

Agriculture and Food

**Contributing Practice Areas**

Climate Change; Environment, Natural Resources & the Blue Economy

## CLIMATE

**Climate Change and Disaster Screening**

Yes, it has been screened and the results are discussed in the Operation Document

## SYSTEMATIC OPERATIONS RISK- RATING TOOL (SORT)

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

## LEGAL

### Legal Covenants

| Sections and Description |
|---|
| Program Institutions (at provincial level) Program Agreement (PA), Schedule, Section I.B.1.(a): The Program Implementing Entity shall maintain, and cause to be maintained, the following entities, with composition, powers, functions, staffing, facilities and other resources acceptable to the Bank: (a) the Provincial Program Steering Group; (b) the Provincial Program Management Office; and (c) a joint expert group. |
| Program Institutions (at county level) PA, Schedule, Section I.B.1.(b): The Program Implementing Entity shall maintain, and cause to be maintained, the following entities, with composition, powers, functions, staffing, facilities and other resources acceptable to the Bank: (a) a program leading group in each of the Program Counties; and (b) a county program management office in each of the Program counties. |
| Program Implementation Plan PA, Schedule, Section I.B.3: The Program Implementing Entity shall, and shall cause the Program Counties to, apply, throughout the period of implementation of the Program, the Program Implementation Plan in a timely and efficient manner acceptable to the Bank. The Program Implementing Entity shall, and shall cause the Program Counties to, not amend, suspend, or waive said Program Implementation Plan or any provision or schedule thereof, without the prior written agreement of the Bank. |
| Mid-term Review PA, Schedule, Section III.2: The Program Implementing Entity shall prepare, under terms of reference acceptable to the Bank, and furnish to the Borrower and the Bank no later than 36 months after the Effective Date, a consolidated mid-term review report for the Program, summarizing the results of the monitoring and evaluation activities carried out from the inception of the Program, and setting out the measures recommended to ensure the efficient completion of the Program and to further the objectives thereof. |
| Program Action Plan LA, Schedule II, Section I.B; The Borrower shall, and shall cause the Program Implementing Entity to take, all measures necessary to comply with, or all measures necessary to enable the Program Implementing Entity to comply with the provisions of Section I.B.2 of the Schedule to the Program Agreement. PA, Schedule, Section I.B.2; The Program Implementing Entity shall, and shall cause the Program Counties to: (a) undertake the actions set forth in the Program Action Plan; (b) not amend, revise or waive, nor allow to be amended, revised or waived, the provisions of the Program Action Plan, or any provision thereof, without the prior written agreement of the Bank; and (c) maintain |

| |
|---|
| policies and procedures adequate to enable it to monitor and evaluate, in accordance with guidelines acceptable to the Bank, the implementation of the Program Action Plan. |
| Verification Agency PA, Schedule, Section III.4: The Program Implementing Entity shall, not later than three (3) months after the Effective Date, hire, and thereafter maintain, throughout the period of Program implementation, verification agent(s) having experience and qualifications in the relevant technical fields, acceptable to the Bank, and under terms of reference, including a time-table and adequate budget for its activities, acceptable to the Bank, to monitor and verify the achievement of the DLRs. |
| PA, Schedule, Section III.(2) Without limitation to the provisions of paragraph 1 of this Section III, the Program Implementing Entity shall prepare, under terms of reference acceptable to the Bank, and furnish to the Borrower and the Bank no later than thirty-six (36) months after the Effective Date, a consolidated mid-term review report for the Program, summarizing the results of the monitoring and evaluation activities carried out from the inception of the Program, and setting out the measures recommended to ensure the efficient completion of the Program and to further the objectives thereof. |
| PA, Schedule, Section III.(3) The Program Implementing Entity shall provide to the Bank, no later than three (3) months after the Closing Date, the report referred to in Section 5.08 (c) of the General Conditions all such information as the Borrower or the Bank shall reasonably request for the purposes of that Section. |
| LA, Article 4.01: The Additional Event of Suspension is that the Program Implementing Entity has modified, suspended, or adopted a successor program to the Gansu Sustainable Agricultural Development Plan, which will materially and adversely affect its ability to achieve the objective of the Program and/or perform any of its obligations under the Program Agreement. |

**Conditions**

| Type | Citation | Description | Financing Source |
|---|---|---|---|
| Effectiveness | LA, Article V, Section 5.01 | The Program Implementing Entity has adopted the Program Implementation Plan, in form and substance acceptable to the Bank. | IBRD/IDA |

## I. STRATEGIC CONTEXT

### A. Country Context

1. **China's economic development and climate change are closely interrelated, yet its quest for growth and prosperity is increasingly constrained by the impacts of climate change**. **Since 2020, China has seen a moderation in economic growth rates**, resulting from structural shifts of its drivers from public investments in infrastructure to private consumption. At the same time, as highlighted in the China Country Climate and Development Report (CCDR, 2022), climate change is increasingly becoming a constraint on economic growth and could threaten to reverse its development gains[1]. Losses from adverse climate events could reduce GDP by between 0.5 and 2.3 percent as early as 2030, and income losses will disproportionately hurt the 40 percent of households with lowest incomes. Today China accounts for a third of global emissions, playing an essential role in slowing global emission trends.[2] The country is also the world's largest emitter of methane ($CH_4$)[3], which has 84–87 times the global warming potential of carbon dioxide over a 20-year timescale,[4] as well as of nitrous oxide ($N_2O$), another highly potent GHG.[5]

2. **After 40 years of unprecedented economic growth[6], China eradicated absolute rural poverty in 2020, ten years ahead of the United Nations' Sustainable Development Goal target of 2030.** According to the last accessible household survey data from 2020, the share of rural people living below the extreme international poverty line of US$2.15 per day (2017 PPP) had fallen to below 1 percent. Despite this remarkable achievement, about 348 million Chinese remain below the poverty line of US$6.85 per day which is used in upper-middle-income countries, of which two-thirds reside in rural areas. Approximately 40 percent of China's population (or 570 million people) still live in rural areas, and many are vulnerable to falling back into poverty in face of an economic shock or natural disasters, such as floods and droughts. Rural revitalization, as per the National Rural Revitalization Program (RRP, 2018–2035) adopted in 2017, is seen as a way to consolidate earlier rural poverty reduction gains going forward.

3. **China's agriculture sector is the largest global emitter of GHG emissions, accounting for 13 percent of the global emissions from agriculture.[7]** Agriculture is the fourth largest source of GHG emissions in China after the energy sector, manufacturing and construction, and industry, accounting for 6 percent of the total GHG emissions, equivalent to 792 $MtCO_2e$ a year.[8] Progress toward reducing GHG emissions from agriculture is being made, although the agriculture sector remains far from carbon neutrality.

4. **The livestock subsector, while an important contributor to ensuring the country's food security, is the largest source of agriculture GHG emissions in China** (at 39.2 percent), followed by inefficient fertilizer use (21.8 percent) and paddy rice cultivation (16 percent). Of the livestock sector GHG emissions, gastroenteric fermentation from ruminant animals (28.7 percent) and poor livestock waste management (10.5 percent) are the main sources. Beef has the highest GHG intensity (19.6 kg $CO_2e$/kg), followed by mutton (10.0 kg $CO_2e$/kg), chicken (4.4 kg $CO_2e$/kg), and pork (3.8 kg

[1] World Bank, China: Country Climate and Development Report (CCDR), 2022.
[2] Ibid.
[3] Methane Tracker 2022 - Analysis - International Energy Agency.
[4] Ibid.
[5] Nitrous oxide is 300 times more potent than $CO_2$ and takes 114 years to break down.
[6] China's nominal gross domestic product (GDP) per capita grew from US$229 in 1978 to US$12,720 in 2022 (World Bank).
[7] China: CCDR, World Bank 2022.
[8] Ibid.

$CO_2e$/kg). Livestock is the main source of both methane, accounting for nearly one-quarter of the country's annual anthropogenic methane emissions, and nitrous oxide emissions. The sector is gradually transitioning towards more consolidated, intensive commercial livestock production systems. While this is expected to reduce the GHG intensity per unit of livestock products compared to extensive production systems, it could increase point and nonpoint sources of air and water pollution.

5. **The demand for livestock products is expected to continue increasing, with growing disposable incomes driven by urbanization.**[9] It has been estimated that by 2030, the demand for beef in China will grow by 82 percent, 87 percent for mutton, 97 percent for yoghurt, and 10 percent for milk (Food and Agriculture Organization [FAO]). The livestock sector plays an important role in ensuring the country's food and nutrition security goals, and also as a source of jobs and incomes to producers and processors along its value chains.

6. **The Government of China has embarked on greening its agriculture sector development.** A series of strategies and plans have been adopted to ensure a more *sustainable* and greener economic development pathway going forward. First, the *Sustainable Agriculture Development Plan (2015–2030)*, which underpins this Program-for-Results (PforR), was adopted in 2015. The *Green Agriculture Development Strategy* launched in 2021 promotes green growth and decarbonization in the agricultural (including livestock) sector and addresses the issues of GHG emissions and pollution, low resource use efficiency, and sustainability of food production systems. *The National 14th Five-Year Plan (FYP) for Green Agriculture Development (2021–2025)* aims to increase land and water resource use efficiency, reduce agricultural GHG emissions, improve agricultural ecosystems and environmental quality, and reduce chemical fertilizer and pesticide application. China's response to the challenges created by climate change is also articulated through its 'dual carbon' goals (2020), which aim to peak the carbon dioxide emissions by 2030 and achieve carbon neutrality by 2060. These ambitious goals, however, will require structural transformation of food systems to achieve the triple wins of increased productivity, reduced GHG emissions and enhanced climate resilience. This requires changes in production scale and structure towards more professionally managed commercial entities which have ability to adopt modern technologies and practices.[10] Manure management,[11] modern livestock rearing practices which reduce carbon intensity, and technology adoption for forage production are some of the examples that have been successful in achieving the triple wins.

### B. Sectoral (or Multi-Sectoral) and Institutional Context

7. **Gansu Province is one of the poorest provinces in China with lingering relative poverty.** With a population of about 25 million (2022), Gansu ranks last out of 31 provinces and administrative regions in China in terms of GDP per capita. Rural population accounts for 46 percent of the province's population. Agriculture represents 13.3 percent of the province's GDP - one of the highest among China's provinces - compared to 7.3 percent of China's average (World Bank, 2022). Agriculture's share of employment is 25 percent compared to 23 percent of national average (World Bank, 2022).[12] In Average personal disposable income per capita was CNY 23,273 in 2022 (approx. US$ 3,502), equivalent to 63.1

[9] During 2013–2021, the 65 percent increase in real personal disposable income showed concomitant increases in p.c. consumption of livestock products of 67 percent for beef, 56 percent for sheep meat, 94 percent for poultry meat, and 27 percent for pork. China Statistical Yearbook, 2022.
[10] World Bank and Global Environment Facility-financed projects have piloted and scaled up sustainable livestock management practices, in particular the Climate Smart Management of Grassland Ecosystems (P166853) project and the China Guangdong Agricultural Pollution Control (P127775/P127815) project.
[11] The Government has supported an effective program to improve manure management on 279,000 large-scale livestock farms, which has increased manure utilization rates to 75 percent and modernized and mechanized 95 percent of manure management systems on these farms.
[12] HKTDC Research.

percent of national personal disposable income of CNY 36,886 per capita.[13] Around 13.3 percent of people in rural areas in Gansu are beneficiaries of social assistance programs for low-income families (*Dibao* and *Tekun*), with per capita incomes below RMB 415.2/month (US$ 3.84/day in 2017 PPP terms).[14]

8. **The livestock sector is a key engine for economic and income growth in Gansu province.** The sector accounted for 44 percent of the value of agriculture sector value added in 2021 (Gansu Department of Agriculture and Rural Affairs [DARA]). The number of animals is expected to continue growing over the next 5–7 years, at an estimated rate of 4 percent per year[15]. However, a significant livestock productivity gap exists between Gansu and the rest of China. The average milk yield per cow in the province is 65 percent lower than the average in China (2,088 kg in Gansu vs. 5,940 kg in China), and beef productivity is 26 percent lower than in China (109 k/cattle vs 140 kg/cattle). Only mutton productivity slightly exceeds the China-average (15.9 kg/animal vs. 15.6 kg/animal).[16]

9. **The livestock-driven economic growth over the past decades has resulted in rapidly rising sectoral GHG emissions.** The sector emissions increased from 5.4 million tons in 2000 to 8.3 million tons in 2017, with an average annual growth rate of 2.5 percent.[17] Carbon emissions caused by livestock farming account for 71 percent of the total emissions, including 43 percent coming from livestock manure and 28 percent from enteric fermentation[18]. Enteric fermentation accounts for between 60 and 86 percent of the total emissions per animal and ruminants account for 78 percent of GHG emissions from meat production in Gansu, over two-thirds of which comes from cattle. The GHG emission intensity in Gansu's livestock system is a third higher than the national average.[19] Therefore, introduction and scale-up of modern low-emission livestock production technologies and practices are needed to reduce net livestock GHG emissions.

10. **The livestock sector in Gansu is characterized by low levels of modernization coupled with high resource use intensity.** The livestock sector overall is characterized by low animal productivity, high GHG emission intensity, fragmented and underdeveloped value chains, and low awareness and adoption rates of low-emission technologies and practices. The veterinary services in Gansu, similar to the rest of China, are struggling to address issues related to food safety, antimicrobial resistance (AMR), and control of zoonotic and animal diseases, resulting in limited outreach to livestock farms. Vaccination programs are reaching around 80 percent of large more commercial farms but, on average, only around 40 percent of medium-sized and smallholder livestock farms in the province. At the same time, good animal health practices are essential for improving productivity and reducing animal mortality from diseases, thus lowering the emission intensity per unit of output.

11. **Sustainable fodder production will be a critical factor in enhancing the livestock sector's productivity in Gansu while reducing its environmental and climate footprints.** Large forage gap exists in China's mid-western provinces, including Gansu[20]. Gansu is highly vulnerable to climate change, as the region experiences significant climate risks and

[13] China Statistical Yearbook, 2023.

[14] *Source:* Ministry of Civil Affairs. Additionally, the PPP factor for rural China is 3.5.

[15] It should be noted that this estimated increase in the livestock numbers is subject to several potentially restricting factors, such as the availability of feed and other resources, and – ultimately – the market demand for the products.

[16] National Statistics Bureau, MARA, Gansu DARA. 2021.

[17] Ying, Lv. 2020. "Comprehensive Calculation and Driving Force Analysis of Agricultural Carbon Emissions in Gansu Province." *Journal of Cooperative Economy and Technology* 20.

[18] The inverse ratio between the emissions from enteric fermentation and manure is likely due to the manure left in the grazing lands.

[19] Wei, Ying, Xue Zhang, Mejia Xu, and Yuan Chang. 2023. "Greenhouse Gas Emissions of Meat Products in China: A Provincial-level Quantification." *Resources, Conservation and Recycling* 190 (2023): 106843.

[20] A large forage gap in forage availability in traditional pastoral regions in China. T. Yang, J.Dong, L.Huang, Y.Li, H.Yan, J.Zhai, J.Wang, Z.Jin, G.Zhang. Fundamental Research 3 (2023).

hazards, particularly droughts. The combination of these effects poses risks to food, water, and nutrient security. It also increases the transmission risk of climate-sensitive infectious diseases for humans and livestock. Droughts, for instance, can lead to a reduction in vegetation growth, resulting in reduced carrying capacities and soil degradation. Addressing these climate risks and hazards is, therefore, crucial to ensure the sustainability and resilience of feeding material and fodder production for the livestock sector. Sustainable and climate-resilient production of fodder crops is therefore critical to support the intensive livestock sector development in Gansu province, while reducing the sector's environmental footprint.

12. **Gansu is highly vulnerable to climate change, as the region experiences significant climate risks and hazards, particularly droughts and increasing temperatures, and has scarce environmental systems.** The province's environmental systems are characterized by water-scarcity and highly erodible and low-quality soils which contribute high degrees of sedimentation. The natural resource base for agriculture is limited by a harsh, arid climate with average rainfall of 300 mm and cold winters due to its high altitude (> 1000 m); a limited area of good quality arable land and limited water for irrigation. Gansu is one of China's provinces hardest hit by desertification. The province, which includes parts of the Gobi, Badain Jaran, and Tengger Deserts, is suffering from significant moisture drawdown. Annual precipitation is low, varying from 35-40 mm in the north to 735 mm in the south. Climate events, such as droughts, can lead to a further reduction in vegetation growth, resulting in reduced carrying capacities and soil degradation. Addressing climate risks and hazards is, therefore, crucial to ensure the sustainability and resilience of the livestock sector.

13. **The Program aims to reduce GHG emissions and increase productivity and climate resilience of the medium and large livestock production entities (hereinafter Target Livestock Production Entities[21] (TLPEs)), which will serve as demonstration for other farms, cooperatives and enterprises.** This is because such TLPEs, which are more commercially oriented, have higher capacities, willingness and potential economic gain in adopting new technologies and practices[22]. The novel contribution of the proposed Program is enhancing the governance system for the uptake of new technologies and practices beyond the immediate Program counties. This includes the development of a Measurement, Reporting and Verification (MRV) system for emission reductions from livestock-related activities, which will be the first in China's livestock sector. This will also allow the province to connect more easily to monetize carbon credits once the carbon market for agriculture reopens in China (see footnote), with farmers able to benefit from the additional income streams from the sale of emission reductions to voluntary markets.

14. **The low emission technologies and practices demonstrated by the Program will contribute to closing the productivity gap in the livestock sector.** The proposed PforR is one of the first low emission livestock sector interventions supported by the World Bank, providing an opportunity to replicate the lessons learned to support similar sustainable, productivity-increasing and GHG emissions-reducing livestock projects in other middle income client countries**.** TLPE-level economic analysis indicates that, compared to the BAU scenario, the targeted technological and practice packages[23] (i.e., improving forage quality, feed substitutes, feed supplements, precision feeding, methane inhibitors) would increase livestock productivity on average by 10-20 percent, which is consistent with international evidence. There are no one-time or recurrent subsidies envisioned for these novel technologies under the Program. The analysis carried out during the preparation showed that such technologies are expected to be profitable, based on international experiences, and this will be assessed and confirmed further during the PforR implementation through the mechanisms devised under DLI#6,

[21] TLPEs include medium and large commercially oriented household/family farms, cooperatives and enterprises.

[22] It should be noted that a consolidation process is ongoing in China's livestock sector and the number of smallholder farms is expected to fall during the next few years. Therefore, it is expected that medium and large farms will be taking up the new technologies and practices first.

[23] The average investment is expected to be US$20,000 – 30,000 per TLPE, with a maximum of US$100,000 per TLPE for high-tech technologies (such as precision feeding equipment, biodigesters, etc.).

which is also supporting the ongoing processes of rebalancing public expenditure programs in China, including Gansu, from provision of private goods towards provision of public goods and services.

15. **The increased productivity is expected to result in increased profitability at the TLPE level**. Table 1 below provides the results of the profitability estimate calculations based on the sub-sector and TLPE size. The profitability estimates are averages, based on results of three combined technology and practice packages. The analyzed packages include the following technologies and practices: improved forage, feed substitutes, feed supplements, precision feeding, methane inhibitors, and manure collection and storage (see Annex 2 for details). The new technologies and practices are estimated to increase TLPE incomes by 10-20 percent (depending on the farm size) compared to traditional animal husbandry practices, mainly through improved productivity growth. Profitability growth is estimated highest for cooperatives under beef production model; enterprises under dairy model and medium sized farms under mutton production model. A Low Emission Technology and Practice in Livestock Sector Manual will be prepared (a PAP action) within three months of the Effectiveness with the detailed costing and resource requirements for the new technologies and practices. This will serve as the basis for the design of the context-specific packages of the technologies/practices tailored for the beneficiaries, to ensure profitability of these technologies to the TLPEs and maximize the GHG emission reductions.

**Table 1: Estimated Profitability Improvements by Farm Size, with Program Interventions[24]**

| Livestock/ Operations | Farm Size | Animal Population | Annual Net Income | |
|---|---|---|---|---|
| | | | BAU (CNY) | % Increase with PforR interventions |
| Beef Production | Medium household/family farm | 30 | 24,000 | 13% |
| | Large household/family farm | 50 | 41,000 | 12% |
| | Cooperative | 200 | 196,000 | 18% |
| | Enterprise | 600 | 640,600 | 19% |
| Dairy Production | Medium household/family farm | 15 | 9,750 | 15% |
| | Large household/family farm | 30 | 21,000 | 10% |
| | Cooperative | 300 | 252,000 | 15% |
| | Enterprise | 800 | 728,000 | 17% |
| Mutton Production | Medium household/family farm | 100 | 5,000 | 20% |
| | Large household/family farm | 200 | 11,000 | 15% |
| | Cooperative | 500 | 35,800 | 18% |
| | Enterprise | 900 | 66,700 | 19% |

16. **The technologies and practices supported under the proposed PforR would result in lower GHG emissions in the Program area[25].** This is expected to come from: (i) reduced herd expansion rate of 3.5[26] percent from a projected 4 percent growth rate, due to the herd management and productivity improvement activities; and (ii) reduced emissions from the livestock-management activities by at least 26.7 percent. The traditional technology contribution accounted for a 15 percent reduction in emissions from enteric fermentation, and from manure management: 5 percent at MTR stage, and 10 percent at completion stage. The new technologies (inhibitors/additives) supported by the PforR are estimated to reduce methane emission from enteric fermentation by some 20 percent over traditional practices. It is projected,

[24] The Program interventions also include extension services and advice to the TLPEs. The sources of data for the technology packages are: data from TLPEs, international and national experts engaged by the Bank team during preparation, and research sources. Data on the current farm sizes, income levels, and potential technologies most likely to be adopted by the TLPEs were obtained from Program Counties Bureau of Agriculture, in consultation with the TLPEs.

[25] The Program area is defined as 700 TLPEs and 10,000 ha of fodder production area.

[26] Given the province's focus on high productivity livestock going forward, the herd growth rate may be lower, at 2 percent.

therefore, that GHG emissions will be reduced by 67,858 tons of $CO_2$ equivalent annually at the mid-term of project implementation period, and by 78,310 tons annually at the completion stage. This calculation of 20 percent emission reduction from the new technologies is a conservative, lower bound estimate, if compared to 35 percent emission reductions from similar technology pilots in New Zealand and other countries.

**Table 2: Expected GHG Emission Reduction in the Program area, with Program interventions[27]**

| Parameters | Program-Supported Results of GHG Emission Reduction | | |
|---|---|---|---|
| | 2023 (Baseline) | 2027 (MTR) | 2030 (Implementation Completion) |
| Number of animals, BAU (with a growth projection of 4.0% p.a. (provincial target)) | 269,748 | 315,567 | 354,970 |
| Total Emissions, BAU, $tCO_2e$ | 216,730 | 254,258 | 286,176 |
| Number of animals, with Program interventions in the livestock sector (growth projection of 3.5% p.a.) | n/a | 309,542 | 343,195 |
| Total Emissions, with Program interventions in the livestock sector (herd management+ new technologies and practices), $tCO_2e$ | n/a | 186,400 | 207,866 |
| Emission reduction rate in livestock, "with" vs "without" the Program, % | n/a | 26.7% | 27.4% |

## C. Relationship to the CPS/CPF and Rationale for Use of Instrument

17. **The proposed Program is aligned with the World Bank's Country Partnership Framework (CPF, FY 2020–2025) for China (Report No. 117875-CN)[28]**, which was discussed by the World Bank Board of Directors on December 5, 2019. The CPF identifies two broad areas of support: closing the remaining institutional gaps in China's development and the generation of global public goods (GPGs), and three associated areas of engagement: (a) advance market and fiscal reforms, (b) promote greener growth, and (c) share the benefits of growth. The planned Program activities directly contribute to closing the remaining institutional gaps and promote greener growth. To contribute to closing the institutional gaps, the Program focuses on the establishment of governance systems for the uptake of low-emission technologies and practices in the Gansu livestock sector. Under the Engagement Area 2, the World Bank Group (WBG) aims to support the Government's efforts to (a) reduce air, soil, and water pollution; (b) demonstrate sustainable agricultural practices and improve animal health and control of trans-boundary disease management; and (c) strengthen institutional capacity for greening the livestock sector. The proposed Program supports greener growth by facilitating the implementation of results which would lead the transition to a lower-carbon pathway in livestock sector development; reducing air, soil, and water pollution; demonstrating sustainable livestock and agricultural practices; improving animal health and disease risks of the selected livestock value chains, resulting in safer and higher-quality products for consumers; and strengthening institutional capacity for green livestock sector development.

[27] The BAU in the Table 2 is calculated using GLEAM-i tool, which is FAO's Global Livestock Environmental Assessment Model (GLEAM), used in project preparation to calculate greenhouse gas emissions using IPCC Tier 2 methods; team's calculations of the GHG emission reduction scenarios. The approach described in paragraph 16 is used for the calculation of the emission reduction estimates as GLEAM-I tool cannot be used to account for the advanced technologies (such as inhibitors), although they are expected to contribute a significant portion of GHG emissions under the Program

[28] World Bank Group. 2021. China – Country Partnership Framework for the Period FY2020–2025. (Report No. 117875-CN). Washington, DC: World Bank Group. https://documents1.worldbank.org/curated/en/902781575573489712/pdf/China-Country-Partnership-Framework-for-the-Period-FY2020-2025.pdf.

18. **The Program's contribution to GPGs.** Given China's global contribution to GHG emissions from agriculture, the planned Program's results will generate significant global and regional public goods, as shown in Box 1.

**Box 1. Contribution of the Gansu Province's PforR to GPGs**

The proposed Program will contribute to GPGs through the following actions:

(a) **Reduced GHG emissions.** The PforR is expected to generate substantial climate benefits by centering on the implementation of mitigation and adaptation measures. The Program will result in reduced GHG emissions, in particular, methane, from improved livestock feeding regimes (high-protein/legumes fodder production, emission-reducing additives, and other advanced technological measures), better animal health practices, improved animal breeds and manure management practices, etc., and an enabling environment for the uptake of low-emission and resilience-improving technologies and practices and facilitating development of tradeable emission reductions from the livestock sector. The GHG mitigation measures would also reduce soil and water pollution, contributing to regional benefits. The Program areas are located in the Yellow River basin, which is the second largest river in China. By supporting livestock manure treatment to remove pollutants such as chemical oxygen demand (COD) and biological oxygen demand (BOD), and nutrients like nitrogen and phosphorus, the PforR contributes to preventing pollutants and nutrients from entering water bodies, hence reducing point and non-point source water pollution.

(b) **Contributing to the global knowledge for development.** Low-emission technologies and practices successfully implemented in livestock value chains in Gansu can be scaled up in China, and globally. The establishment of the enabling environment and governance systems enables the scale-up of low-emission technologies and practices in Gansu's livestock sector in the future. They include development of the technical standards and measurement, reporting, and verification (MRV) system and realignment of incentive systems, which generate knowledge for successful implementation of similar activities elsewhere. Lessons and knowledge generated by the Program would be relevant for other middle-income countries which aim to reduce GHG emissions in their livestock sectors.

19. **The proposed Program is anchored in the CCDR and fully aligned with the World Bank's global commitments, WBG's Green, Resilient and Inclusive Development Framework, the WBG's Climate Change Action Plan (2021–2025), and the World Bank's Gender Strategy.** The Program supports implementation of climate mitigation and adaptation actions identified under the CCDR, which highlights the use of low-emission practices and technologies in agriculture sector as key for emission reduction. It also follows the CCDR recommendation on the realignment of subsidies in the agriculture sector, which is coordinated with the targeted investment in MRV systems, to allow for the gradual shift in payments toward environmental outcomes. It will support institutional strengthening and capacity building to create the enabling environment for scaling up sustainable low-emission livestock production. The proposed PforR is expected to contribute to the World Bank's new scorecard and climate commitments by promoting productivity and reducing GHG emissions from livestock sector. Responding to the World Bank's Gender Strategy, the proposed Program aims to address the issues of women's access to agricultural inputs and other productive resources, extension services, and trainings which would enable women to benefit from economic opportunities in livestock sector while increasing their representation in decision-making processes. These are aligned with Pillar 2 (Removing Constraints for More and Better Jobs) and Pillar 3 (Enhancing Women's Voice & Agency and Engaging Men and Boys) of the World Bank's Gender Strategy (2017–2023). The Program remains relevant under the new draft Gender Strategy (2024–2030), which is expected to be launched shortly.

20. **The proposed Program also supports the implementation of China's Nationally Determined Contribution (NDC),** updated and submitted to the United Nations Framework Convention on Climate Change in October 2021[29]. In the updated NDC, China reaffirmed its commitment to tackle climate change under the terms of the Paris Agreement and reiterated its dual carbon goals. The Program specifically focuses on measures within the agriculture sector that contribute

[29] The 2021 United Nations Climate Change Conference is more commonly referred to as COP26.

to both mitigation and adaptation efforts. These measures include reducing agricultural emissions, increasing carbon sinks in agricultural ecosystems, and enhancing the sector's resilience to climate change. The Program is well aligned with China's climate change commitments and in line with China's Long-Term Strategy and National Climate Change Adaptation Strategy 2035. The Program has considered the country's *Implementation Plan of Emission Reduction and Carbon Sequestration for Agriculture and Rural China* issued in 2022.

21. **A PforR financing instrument has been selected for the World Bank's support to Gansu's livestock sector**. The Government program is supported by strong political and financial commitments from the provincial and local-level governments. The design of the PforR is well aligned with the government's expenditure structure. This allows to leverage the significant public financing that is allocated for greening the agriculture sector under the government strategy and improve the efficiency, targeting and effectiveness of these expenditure programs for generating results at scale and enhance the borrower systems toward the achievement of more impactful results. Additionally, it will also allow for a scaling up of the low emission livestock technologies and practices based on the PforR results and strengthening of the institutional and country systems for the delivery of the results beyond the targeted Program areas after the demonstration phase supported by the PforR.

## II. PROGRAM DESCRIPTION

### A. Government Program

22. **Three relevant sector plans within the broader Gansu sustainable agricultural development strategy underpin the design of this PforR.** The strategy contributes to the implementation of the National Sustainable Agricultural Development Plan (NSADP; 2015–2030), which sets out the goal of achieving the sustainable agriculture development outcomes by 2030. It is expected to be accomplished by establishing a new pattern of sustainable agricultural development characterized by "efficient resource utilization, green production environment, stable ecosystem, and beautiful pastoral scenery." The three sector plans, specifically, the Notice by the People's Government of Gansu Province (PGGP) on Accelerating, Establishment and Improvement of the Implementation Plan for a Green, Low Carbon and Circular Development Economic System; Notice of the General Office of the PGGP on the Implementation Plan for Optimizing and Upgrading the Agricultural Industrial Structure Using the Breeding Industry as the Lead; and Gansu Province Green Carbon Sequestration Implementation Opinion, provide the programmatic framework for the PforR. The three relevant sector plans focus on the livestock sector as a means to: develop a green, low-carbon and circular economy; upgrade the province's economic development with livestock as the leading industry; and reduce GHG emissions.

23. **The above three sector plans include the following narrowed-down sub-set of activities which define the PforR boundaries**: adoption of green and low emission technologies in livestock sector; improved breeding of livestock and improved animal health; improved fodder production; enhanced utilization of livestock manure resources and implementing advanced technologies for manure management to reduce methane and nitrous oxide emissions; improved food safety for livestock products; establishment of a monitoring and evaluation (M&E) system to track progress and ensure the effectiveness of green, low-carbon, and circular development practices in the agricultural sector (including livestock); developing supporting policies for carbon sequestration in agriculture and supporting relevant policy incentives.

24. **These Government programs are linked to specific expenditure lines which define the PforR expenditure framework.**[30] The relevant budget lines include: the market supervision and administration affairs (20138) and public

[30] Please see full description related to the budget lines in the Technical Assessment, Program Expenditure Framework section.

health (21004), which finance the public sector agencies, both investment needs and operating costs. Under the rural environmental protection budget line (2110402), the funds are utilized for environmental pollution prevention and control, investigation, and remediation, monitoring and control. Eligible cooperatives and farmers receive funds for managing and protecting soil and water bodies, collection, and treatment of pollutants. Ecological environment monitoring and information program (2111101) is a provincial-level program to support agricultural ecological monitoring system development and subsidies for environmental pollution control. Under the agricultural and rural affairs program (21301), the PforR-relevant expenditures include: pest and disease control (2130108); quality and safety of agricultural products (2130109); agricultural production development (2130122); processing and promotion of agricultural products (2130125); conservation, restoration, and utilization of agricultural resources (2130135); and farmland improvement (2130153). On average across all programs, public sector agencies receive around 10 percent of the financing towards investment, operating costs, and staff capacity building. Around 90 percent of funds finance services for enterprises, cooperatives, and farmers. Private sector participants receive funds either on first come first served basis, or through a competitive selection. In both cases, interested potential beneficiaries apply to receive the resources. For the purposes of the PforR, the amount in the relevant budget lines has been further narrowed down to include either public sector financing at the provincial level (DLIs#5 and #6), or financing that targets enterprises (similar to TLPEs) under the PforR (DLIs#1 to #4 and DLI#7). Thus, the PforR-relevant expenditures under the 10 government programs amounted to US$412.4 million during 2020-2022 (see Table 6 below).

### B. Theory of Change

**25. The key rationale for the proposed Program is to lower methane and other GHG emissions from the livestock sector in Gansu, which serves as a demonstration for scaling up elsewhere.** Gansu is one of the poorest provinces in China, with a significant and growing livestock sector. It is also significantly vulnerable to climate-related shocks. These conditions provide a good basis for the piloting and demonstration of innovative approaches, aimed at lowering methane and other GHG emissions, increasing farm incomes through productivity enhancement, and strengthening resilience against climate shocks. To be more specific, the Program promotes low emission technologies and practices which reduce GHG emissions and enhance resilience, but also increase productivity and incomes of the livestock sector participants. It does so through the following channels: (a) improving animal health. Global evidence shows that unhealthy livestock can emit up to 30 percent higher GHG emissions compared to healthy ones (FAO). The PforR supports disease control, which leads to healthier livestock, therefore reducing GHG emissions, stock losses and increasing productivity; (b) improved feeding practices. Precision feeding provides high-quality nutritious feed and improves animal growth rates, thus enhancing productivity and enabling more efficient resource use; (c) fodder management. Use of drought-resistant fodder crops, water-saving practices, and animal breeds, make livestock systems more climate resilient. These actions also generate local economic development multiplier effects which create jobs and livelihood opportunities for surrounding communities in downstream value chain segments (processing, marketing, distribution and service provision).

**26. The Program would ensure sustainability of the PforR by strengthening government institutions and systems (extension and health services) on the one hand; and furthering commercial interest in TLPEs through improved productivity, efficiency, and access to higher value market on the other hand.** The opportunity to enter green/organic/low emission consumer markets, which attach higher value to green and sustainable practices would provide higher prices and thus, higher profit motivation for the TLPEs. Furthermore, carbon markets which are being restarted by the government would provide additional incentives for farmers and agro-enterprises to make investments in low-emission livestock value chains. These factors are expected to ensure uptake of the new technologies and practices by other farmers in the Program Counties and in the province. China's model of experimentation and piloting of new ideas,

approaches and technologies in limited geographic areas, and later replication of successful results throughout the country, is also expected to support the sustainability of the Program interventions.

27. **The Program aims to improve productivity and reduce the GHG emissions in the selected livestock (beef and dairy cattle, and sheep/goats) sub-sectors, establishing a system to benefit all farmers in the province based on the PforR results.** The activities[31] are grouped under two Results Areas (RAs) which contribute to the Program objectives. (Figure 1). The new technology and practice demonstrations of the 700 TLPEs, combined with the strengthened extension and animal health services will serve as a strong foundation for a future scale-up of low emission livestock technologies in the Program counties and beyond, building on the PforR results and ensuring the Program's sustainability.

28. **The achievement of the above results depends on the willingness of the TLPEs to voluntarily adopt the new technologies and practices.** The new productivity-improving and GHG emission-reducing technology and practice packages, many of which have not been previously available in China, will be piloted through the 700 TLPEs to test their technical and financial viability in the local context of Gansu in practice. The choice to focus on large and medium TLPEs was deliberate, based on the following considerations: [32] (i) the TLPEs have the financial capacity to make the necessary investments in on-farm low emission technologies and practices under the PforR will be made by the beneficiaries (i.e., TLPEs); and (ii) the TLPEs have the capacity to internalize the benefits of the innovative technology packages and have the requisite ability to adopt them, thus serving as demonstration for the other livestock producers.[33]

29. **The novel nature of such technologies and their upfront costs would require close collaboration between the public and private sector**. The government's ambitious climate agenda and commitments require participation of the private sector. This is facilitated through incentive and support mechanisms, which is common to the adoption of new green/low emission technologies globally, to enhance knowledge transfer and awareness raising and address risks which come with the adoption of new technologies and practices. These technologies are expected to increase productivity and incomes of the livestock sector participants. The opportunity to enter green/organic/low emission consumer markets, which value sustainable practices, would provide additional price incentives. Furthermore, carbon markets which are being restarted[34] by the government and are expected to resume agricultural emission trading, would provide additional benefits for farmers and agro-enterprises to make investments in low-emission livestock value chains.

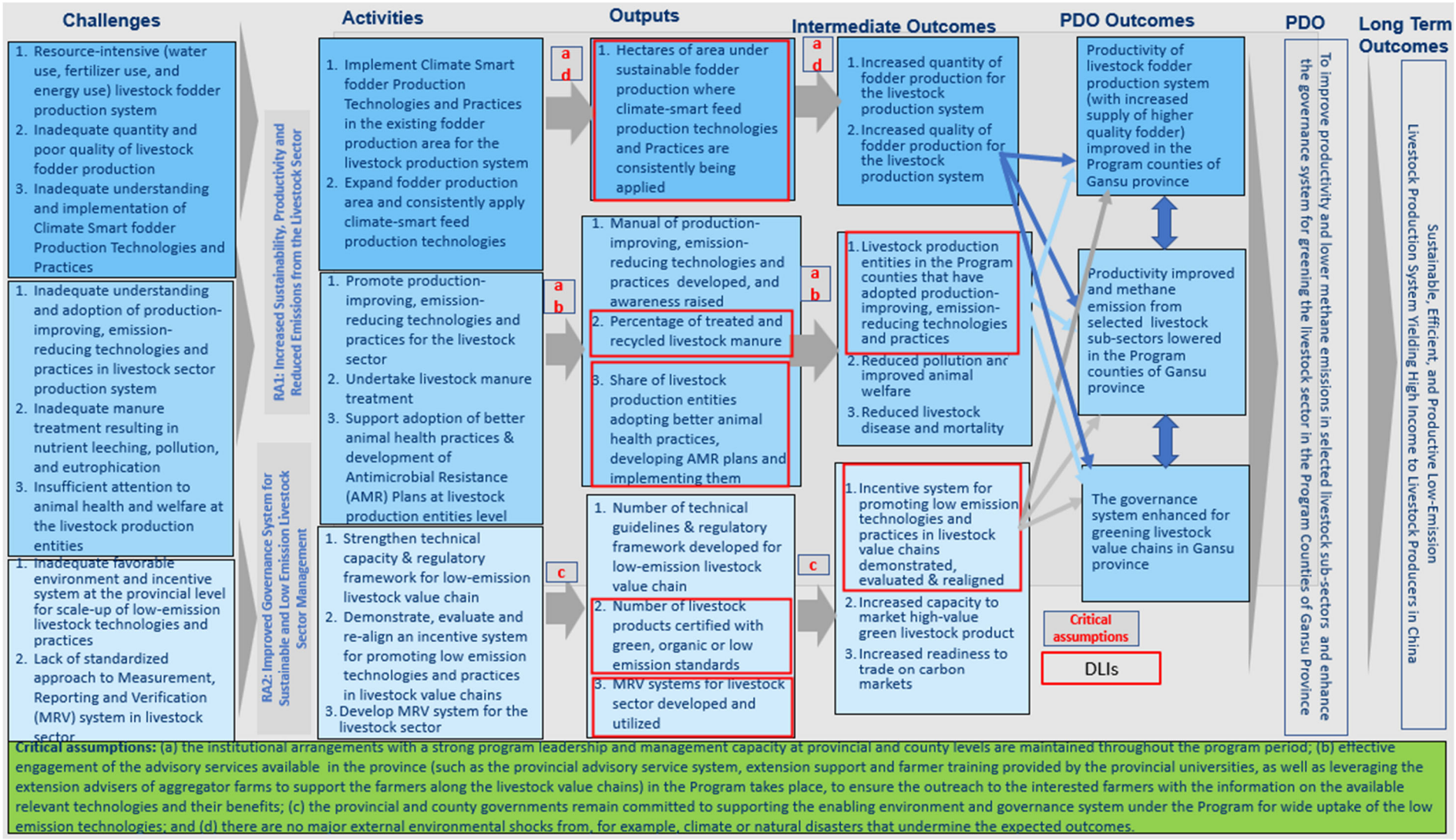
[31] The Program excludes any activities which: (A) in the opinion of the Bank, are likely to have significant adverse impacts that are sensitive, diverse, or unprecedented on the environment and/or affected people; or (B) involve the procurement of: (1) works, estimated to cost $115,000,000 equivalent or more per contract; (2) goods, estimated to cost $75,000,000 equivalent or more per contract; (3) non-consulting services, estimated to cost $75,000,000 equivalent or more per contract; or (4) consulting services, estimated to cost $30,000,000 equivalent or more per contract.

[32] Based on the lessons from the Guangdong Agricultural Pollution Control Project (P P127775/P127815), the PforR will focus on medium and large demonstration livestock production entities. Under the Guangdong project, the leadership role that medium and large farms had in investing and leading adoption of new technologies, was assessed in the project ICR as a critical success factor for achieving the Satisfactory rating of the project.

[33] Ibid.

[34] Launched in 2012, China's Certified Emission Reduction (CCER) scheme was suspended in 2017 due to low trading volumes and lack of standardization in carbon audits. In late 2023, The National Centre for Climate Change Strategy and International Cooperation (NCSC), the key think tank under the Ministry of Ecology and Environment (MEE), have recently released proposed rules on registration procedures, and guidelines for the design and implementation of voluntary carbon offset projects under the CCER scheme. The pilot regulation on registration procedures became effective immediately. It is expected that the voluntary carbon markets are in the process of rebooting.

**Figure 1. Theory of Change for the Program**



### C. PforR Program Scope

30. **The Program consists of the following activities**: *RA1: Increased Sustainability, Profitability and Reduced Emissions from the Livestock Sector.* Supporting: (a) TLPEs in adopting eligible low emission technologies and practices; (b) sustainable fodder production; (c) collection, treatment, and recycling of livestock manure in line with prevailing effluent standards; (d) practices aimed at improving animal health, productivity and welfare through timely vaccination against major animal diseases; and (e) development of anti-microbial resistance plans for improved food safety. *RA2: Improved Governance System for Sustainable and Low Emission Livestock Sector Management.* (a) Developing and using a MRV system for emission reduction in the livestock value chains; (b) developing, evaluating and enhancing an incentive system for promoting low emission technologies and practices in the livestock sector; and (c) obtaining certificates for livestock products with green, organic, or low emission standards.

31. **The proposed Program brings additionality and contributes toward achieving the triple wins in the livestock production systems in Gansu.** Given the continued growth in demand for livestock products the contribution of the livestock sector to GHG emissions is set to increase without effective mitigation efforts. At the same time, livestock productivity improvements are necessary, to support growth of farmer incomes in the province. The Program is therefore centered around introduction of new productivity-improving GHG mitigation technologies and practices, accelerating the mitigation and adaptation efforts in Gansu's livestock sector, and increasing livestock productivity and producer incomes. It does so through: (a) promoting advanced climate smart technologies and practices to improve productivity and climate resilience of fodder production systems; (b) promoting novel technologies and practices to lower GHG emissions and environmental footprint from intensive livestock production systems; and (c) establishing an enabling governance system to support the introduction and future scale-up of the green, productivity-improving and low-emission livestock sector.

32. **The Program will operate in seven counties in five Municipalities/prefectures of Gansu province, as well as at the provincial authority level for selected DLIs**. The total population in the Program counties is 1.2 million (with an average per capita GDP of US$9,094). Average disposable income of farmers was US$2,333 equivalent in 2022, with the income in Guazhou and Sunan counties above, and the other five counties below the provincial average. Employment in animal husbandry is a main source of income, with about 10.5 percent of the Program county population employed in livestock sector, which however, varies from as low as 5.6 percent in Guazhou to 30 percent in Sunan county.

33. **The Program will target 700 TLPEs and 100,000 ha of fodder production area.** The 700 TLPEs are medium and large scale commercially oriented entities, including 52 enterprises, 141 farmer cooperatives, and 507 family/household farms.[35] These 700 TLPEs represent around 35 percent of around 2,000 medium and large-scale livestock production entities in the Program Counties. [36] In terms of the share of livestock, the 700 TLPEs have 86 percent of dairy cattle of those in the Program counties, 23 percent of beef cattle and around and 12 percent of sheep. The 700 TLPEs also represent 18 percent of GHG emissions from livestock production in the 7 Program Counties. The lower share of emissions from the 700 TLPEs are related to the higher share of dairy cattle in the TLPEs which have lower emissions (1.4 tons of CO2e/year)

[35] A socioeconomic survey of 43 of the 700 TLPEs indicated that, on average, 8 jobs have been created per livestock production entity (around 25,000 full-time and part-time employees in the 700 TLPEs), including: 29 percent for women, 15 percent for poor/vulnerable population, and 4 percent for ethnic minorities. They contribute to local economic development, as around 2/3 of the employees come from nearby communities and the average salaries are about 50 percent higher than provincial minimum wage. Some 57percent of the employees have primary or junior middle education and 31 percent have college and university level degrees. The survey data does not find evidence of gender or ethnicity-based salary income differences for similar positions. The ethnic minority workers can celebrate their religious holidays, as needed: around 2/3 of ethnic minority workers can take leave any time needs-based, while 1/3 would need to request leave in advance.

[36] In total, there are 36,600 livestock farms in the Program Counties, of which 95 percent are smallholder farms.

than beef cattle (2.1 t/CO2e/year). At the same time, in terms of animal productivity in the proposed PforR area, the dairy cattle productivity is lowest among the livestock sub-sectors engaged in the PforR, 10 – 50 percent lower than the average in Gansu. In terms of beef production, the average productivity is below the provincial average and only two out of seven proposed counties have above-average productivity. Only mutton productivity is close to Gansu average in the Program counties. Of the 100,000 ha of fodder production area, which will be done on agricultural land, around 31,000 ha will be with the TLPEs and the remaining area will be clearly identified feed production areas within livestock production entities of similar profile as the TLPEs. Detailed information on the livestock production entities is in the Technical Assessment.

34. **Within the government program, the results of the PforR are focused towards increasing productivity and lowering GHG emissions through transforming the livestock sector towards more intensive production systems.** Table 3 below describes the alignment of the PforR with the government program. The PforR's aim is to create a replicable system for future scale-up in other counties of Gansu province and in China. Green growth of Gansu's integrated livestock production system will require measures to increase livestock productivity, profitability, climate resilience and lowering of emissions. The measures which reduce the risks and consequences of poor animal health and animal diseases will reduce the intensity of GHG emissions by raising livestock productivity.

**Table 3. Comparison of the Government Program and PforR Objectives**

| | Government program | Program Supported by the PforR | Alignment with the Government program |
|---|---|---|---|
| **Objective** | The three relevant sector plans focus on livestock sector as a means for acceleration, establishment and improvement of green, low carbon and circular economy; upgrading of province's economic development by adopting the livestock industry as the leading industry; and promoting carbon sequestration in the province across a number of sectors. | Promote enhanced adoption of green and low emission technologies; improved breeding of livestock and improved animal health; improved fodder production; enhanced utilization of livestock manure resources and implementing advanced technologies for manure management to reduce methane and nitrous oxide emissions; improved food safety for livestock products; establishment of a monitoring and evaluation (M&E) system to track progress and ensure the effectiveness of green and low-carbon development practices in the livestock sector; developing supporting policies for emission reductions in agriculture and supporting relevant policy incentives. | The PforR is aligned with the government program and focuses on sustainable and low emission livestock sector development, to contribute to increased productivity and profitability, and reduce GHG emissions and agricultural pollution. |
| **Duration** | 2018–2030 | 2024–2030 | |
| **Geographic coverage** | Entire province: 86 counties in 12 municipalities and 2 prefectures | 7 counties in 5 municipalities/prefectures - Minle county and Sunan county of Zhangye municipality, Lanzhou New District of Lanzhou municipality, Jingchuan county and Lingtai county of Pingliang municipality, Zhengning county of Qingyang municipality and Guazhou city of Jiuquan municipality; provincial authorities for the purposes of implementation of selected DLIs. | Selection criteria for the Program counties included (a) interest and prioritization of the PforR objectives; (b) represent a diverse set of production conditions; and (c) assessed fiscal capacity to borrow. |
| **RAs** | • Focus Area 1 (FA1): Increase the productivity of livestock sector.<br>• FA2: Promote sustainable land use in agriculture.<br>• FA3: Remediation of environmental pollution to improve the agricultural and rural environment.<br>• FA4: Establishment of institutional systems. | • RA1: Increased Sustainability, Profitability and Reduced Emissions from the Livestock Sector.<br>• RA2: Improved Governance System for Sustainable and Low Emission Livestock Sector Management. | The PforR contributes to selected results of FA1, FA2 and FA3 of the government program under the proposed PforR Results Area 1; and FA4 of the government program under the proposed PforR Results Area 2. |

| | Government program | Program Supported by the PforR | Alignment with the Government program |
|---|---|---|---|
| **Overall financing** | Government program: US$ 7.98 billion | Total financing: US$824.8 million<br>Including, IBRD: US$200 million | |

**Program Financing**

**35. The total Program financing is estimated at US$824.8 million,** of which US$624.8 million (CNY 4.44 billion) will be financed by the provincial and county governments and US$200 million will be financed by the IBRD loan.

**Table 4. Program Financing Summary (2024–2030)**

| Source | Amount (US$, millions) | % of Total |
|---|---|---|
| Government | 624.8 | 75.7 |
| IBRD | 200 | 24.3 |
| **Total** | **824.8** | **100.0** |

*Note:* The exchange rate is US$1 for CNY 7.1 (as of February 1, 2024)

## D. Program Development Objective(s) (PDO) And PDO Level Results Indicators

**36. The PDO is to improve productivity and lower methane emissions in selected livestock sub-sectors[37] and enhance the governance system for greening the livestock sector in the Program Counties of Gansu Province.** The Program aims to achieve results through the triple win of improved productivity, reduced emissions, and enhanced resilience in the livestock sector.

37. **The following PDO-level indicators will measure the achievement of the PDO:** (i) Increased productivity in selected livestock sub-sectors (beef, milk and mutton) defined as increase in volume of production among the TLPEs (percentage) (RA1); (ii) Net Green-House Gas (GHG) Emissions (methane, nitrous oxide and carbon dioxide) per year under the Program (Metric tons/year) (RA1 and RA2); and (iii) Enhanced governance system (technical guidelines, MRV system, incentive system and green product certification) achieved (RA2).

## E. Disbursement Linked Indicators and Verification Protocols

38. **The Disbursement-Linked Indicators (DLIs) of the Program have been designed to support the implementation of the three relevant sector plans.** Table 5 provides the values and rationale of each DLI and Disbursement-Linked Result (DLR) to be achieved. Each contributing county will be responsible for the implementation of DLIs/DLRs #1, #2, #3, #4 and #7, and the provincial authorities will be responsible for implementation of DLIs#5 and #6. Each county will be responsible for measuring the achievement of DLI results, which will be aggregated at the provincial level. The DLIs are designed to: (i) be within the control of the Government, (ii) be achievable within the Program period, and (iii) be verifiable. Each county will also be responsible for the implementation of the agreed actions under the Program Action Plan, which includes, for example, monitoring beneficiary composition and distribution of benefits using the Social Benefit Monitoring system to be developed under the Program.

[37] The livestock sub-sectors included under the PforR are: beef cattle, dairy cattle, sheep and goats.

**Table 5. DLIs, DLI Allocations, and Critical Path toward the Achievement**

| DLI | DLRs | Allocated Amount (US$) | As a % of Total | Rationale for Selection | Critical Path Toward the Implementation of the DLI |
|---|---|---|---|---|---|
| **RA1: Increased Sustainability, Productivity and Reduced Emissions from the Livestock Sector** | | | | | |
| DLI#1: Hectares of area under sustainable fodder production in the Program Counties where at least three CSFPTPs are being consistently (i.e., every season or year, as required) applied | DLR #1: Up to 100,000 hectares | 32,500,000 | 16.2 | • This DLI aims to promote sustainable, climate-smart practices in fodder production areas by reducing environmental impact, improving efficiency, and adapting to climate change.<br>• Increased fodder production is expected to have a reduced reliance on natural grasslands, which are vulnerable to degradation due to overuse and climate-related stresses such as droughts and floods. The provision of high-quality feed for livestock through increased fodder production ensures that livestock can maintain productivity even under changing climate conditions.<br>• To adapt to the stresses posed by climate change, fodder production will incorporate Climate-Smart Agriculture (CSA) practices. These practices are designed to enhance soil health (e.g., replacing part of chemical fertilizer with organic fertilizer) and increase water retention capabilities (e.g., reduced or no tillage, rainwater harvesting), thereby bolstering the production system's resilience to drought conditions. Additionally, forage species that are resistant to climate variability would be utilized. Cover crops and crop rotation, and other sustainable agricultural techniques, (e.g., broadcasting seeding) will also be employed to further strengthen the resilience of fodder production to climatic challenges.<br>• This DLI will be implemented at the county level. | To ensure that the fodder production area under new technologies and practices is eligible for inclusion under the DLI, at least three CSFPTP should be applied on a consistent basis (i.e., every season or year, as applicable). The list of eligible agreed technologies and practices is indicated in part A of Annex 7 to the Program Appraisal Document (PAD). |
| DLI#2: Number of unique Target | DLR #2: Up to 700 TLPEs | 46,550,000 | 23.3 | • This DLI aims to contribute to the GHG emission reductions by supporting TLPEs to uptake low-emission | A complete manual of the eligible low-emission technologies and practices, |

| DLI | DLRs | Allocated Amount (US$) | As a % of Total | Rationale for Selection | Critical Path Toward the Implementation of the DLI |
|---|---|---|---|---|---|
| Livestock Production Entities ("TLPEs") that have adopted at least four low emission technologies and practices from the Eligible Technology and Practices List | | | | technologies and practices promoted through the Program.<br>• This DLI supports demonstrations of new low emission technologies and practices (LETPs) and is aligned with DLI#6. Uptake of such LETPs is a key component in reducing emissions from livestock production activities. The TLPEs have the capacity to make the necessary investments and lead the demonstrations to promote these technologies among the other livestock producers in the future.<br>• The technology and practice packages consist of technologies and practices, which are often cost-neutral. The specific set of technology and practice packages for each TLPE will be determined at the outset of the PforR, based on their needs, and building on the existing technologies and practices they may already be deploying.<br>• The technology/practices packages consist of three technologies and practices + monitoring of the outcomes in order to maximize the emission reduction benefits.<br>• This DLI excludes manure management covered under DLI#3 and animal health measures (DLI#4).<br>• This DLI will be implemented at the county level.<br>• The DLI will contribute to mitigation co-benefits through methane emission reduction from enteric fermentation due to use of improved forage, feed substitution, and supplements. It will also contribute to adaptation as well-nourished animals are better | based on the Eligible Technologies and Practices List indicated in part B of Annex 7 of the PAD, will be developed by the Provincial Program Management Office (PPMO) during the first year of the Program implementation. The 700 TLPEs have been selected[38] based on: (i) having an equal number (100) of TLPEs in each Program County; (ii) interested in serving as demonstrations for other livestock entities in the Program Counties and province; (iii) financial capacity to make the necessary co-investments; (iv) capacity to understand the benefits of the technology packages and ability to adopt them; (v) commercial orientation and business motivation to reach higher-end markets with low emission products and market-driven operational sustainability; and (vi) show interest in upgrading their business practices and technologies. |

[38] The TLPE selection process included: (i) DARA developed selection criteria in consultation with the World Bank; (ii) the Agricultural Bureaus of the Program Counties consulted with the Livestock Production Entities (LPEs); (iii) LPEs expressed interest and motivation to join the Program; and (iv) the final list of 700 TLPEs identified.

| DLI | DLRs | Allocated Amount (US$) | As a % of Total | Rationale for Selection | Critical Path Toward the Implementation of the DLI |
|---|---|---|---|---|---|
| | | | | equipped to withstand climate-related stresses and the improved breeding will bring heat and disease-resistant traits. | |
| DLI#3: Share of treated and recycled livestock manure that meets effluent standards in the TLPEs | DLR #3:<br>Year 1: 82%<br>Year 2: 84%<br>Year 3: 86%<br>Year 4: 88%<br>Year 5: 90% | 30,200,000 | 15.1 | • This DLI contributes to the GHG emission (especially methane) reductions by increasing the share of livestock manure treated and recycled into organic fertilizer, irrigation water, and other uses, thus also contributing to the achievement of the 14th FYP's comprehensive manure treatment targets.<br>• This DLI will be implemented in the TLPEs at the county level.<br>• The DLI will contribute to mitigation co-benefits through $CH_4$ and $N_2O$ emission reduction by anaerobic digestion to produce biogas, which is a source of renewable energy. It will indirectly contribute to adaptation co-benefits as the treated manure will also be composted and used as organic fertilizer to improve soil health and help crops better withstand climate stress. | Livestock manure is collected, treated, and recycled from two sources: large farms with on-site treatment facilities and centralized treatment facilities for medium livestock farms. |
| DLI#4: Number of TLPEs adopting improved animal health practices, specifically: (i) achieving vaccination rate against PPR, FMD and brucellosis of at least 90%; and (ii) | DLR #4.1: All TLPEs have achieved at least 90 percent vaccination rate annually against PPR, FMD and brucellosis for their cattle, sheep, and goats;<br>DLR #4.2: Up to 500 TLPEs have developed and adopted AMR plans | (a) 14,750,000<br>+<br>(b) 5,000,000 | 9.9 | • This DLI contributes to the GHG emission reductions in the livestock sector by improving animal health and welfare, and resulting in production efficiency (higher animal productivity) and reduced emission intensity. Vaccination can help animals develop immunity against specific diseases, reducing the likelihood of infection, and be more resilient to the challenges posed by climate change. The improved animal health and welfare also contributes to improved food safety and reduced health risks for consumers of livestock | The achievement of the DLI includes promoting practices[39] aimed at ensuring that the livestock (cattle, sheep, and goats) vaccinations due in any given year are implemented at least at 90 percent; and supporting the AMR plan preparation, which at a minimum, should cover training and raising awareness on responsible use of antimicrobials; enhancing animal welfare and disease |

[39] In addition to the DLI results, overall good animal health and welfare practices will be promoted, such as adequate access of animals to shelter and high-quality pasture/feed, a low-stress environment, good sanitation practices, balanced nutrition that includes vitamins and supplements, and regular testing and monitoring of animal health.

| DLI | DLRs | Allocated Amount (US$) | As a % of Total | Rationale for Selection | Critical Path Toward the Implementation of the DLI |
|---|---|---|---|---|---|
| developing anti-microbial resistance ("AMR") plans | | | | products, as animal diseases could be a potential source of new pathogens that can spread from animals to humans. By improving animal health, livestock production becomes more productive and sustainable.<br>• This DLI will be implemented at the county level.<br>• The DLI will indirectly contribute to adaptation co-benefits given the outcome of improved animal health and productivity. | prevention and control through improved animal husbandry practices; introducing alternative, non-antibiotic based, disease management strategies; and strengthening use of veterinary services which reduces the overuse of antibiotics in livestock production systems. |
| **RA2: Improved Governance System for Sustainable and Low Emission Livestock Sector Management** | | | | | |
| DLI#5: MRV system for emission reduction in the livestock value chains: (a) developed; and (b) utilized. | DLR #5.1: Gansu Province has developed an MRV system, in accordance with the criteria set out in the Verification Protocol; DLR#5.2: Gansu Province has utilized, for purposes of measuring emission reductions in the livestock value chains, an MRV system, in accordance with the criteria set out in the Verification Protocol. | 26,000,000 | 13.0 | • This DLI will contribute to GHG emission reduction and climate change mitigation and adaptation co-benefits by developing MRV methodologies for accounting GHG emission reductions from the livestock value chains.<br>• This DLIs is critical for measuring the outcomes of the Program's results framework indicators. The DLI contributes to strengthening of the regulatory framework and institutional enabling environment for the scale-up.<br>• The MRV system will be used for the emission reduction measurement at the MTR stage as part of its approbation process.<br>• This DLI will be developed at the provincial level and implemented at the county level. | Overall guided by the provincial DARA, the MRVs development should be carried out in close collaboration with multidisciplinary teams from the provincial-level authorities and research and academic institutions. An expert panel will be established at the provincial level to oversee and peer review the MRVs development process and outputs. |
| DLI #:6 Incentive system for promoting low emission technologies and practices in livestock value chains | DLR #6.1: Gansu Province has designed a pilot system for adoption of low emission technologies and practices from the Eligible Technology and Practices List; | 25,000,000 | 12.5 | • This DLI aims to contribute to GHG emission reduction and climate change mitigation and adaptation co-benefits by developing financing mechanisms necessary for supporting agri-businesses, farmers and farmer cooperatives to adopt low-emission and resilient livestock production systems, technologies and practices for the delivery of the global public goods. | The development of the uptake and realignment of the incentive program will follow these steps: (a) design of the pilot, which will be implemented under DLI#2; (b) rigorous evaluation of the pilots, including (i) the data on the implementation — description of the investments supported, incentive |

| DLI | DLRs | Allocated Amount (US$) | As a % of Total | Rationale for Selection | Critical Path Toward the Implementation of the DLI |
|---|---|---|---|---|---|
| demonstrated, demonstration results evaluated, and re-aligned incentive system elaborated. | DLR #6.2: Gansu Province has conducted an evaluation of at least 60% of the pilots carried out under DLI #2, in accordance with the criteria set out in the Verification Protocol; DLR #6.3: Gansu Province has developed and adopted a realigned uptake (including, incentive) system based on the results of the pilots implemented under DLI #2. | | | • The DLI supports the piloting, evaluation, and re-design of the uptake system, including incentives.<br>• This DLI will be developed at the provincial level and implemented at the county level.<br>• This DLI will result in climate co-benefits by supporting the adoption of low-emission livestock value chain technologies and practices. | delivery mechanism, and number of beneficiaries disaggregated by gender; (ii) estimated GHG emissions reduction achieved; (iii) behavioral changes of producers or estimated adoption rate; and (iv) investment's impact on the beneficiaries; and (c) development of the realigned incentive system based on the results of the pilot. |
| DLI #:7 Number of livestock product certificates with green, organic or low emission standards in the Program Counties. | DLR #7: Up to 50 livestock products certificates have been issued signifying green, organic, or low-emission standards, as further described in the Verification Protocol. | 20,000,000 | 10.0 | • This DLI represents the outcomes of successful greening of entire value chains.<br>• The DLI will track the number of newly issued green, organic or low emission product certificates received as a result of implementing green, organic or LETPs.<br>• This DLI is part of the incentive system to promote uptake of green, organic or low-emission production practices and technologies.<br>• The guidelines for the low-emission product certification will be developed as part of Program Action Plan (PAP) (Annex 5) See Verification Protocol for DLI#7 for other details on eligible certificates.<br>• This DLI will be implemented at the county level.<br>• The DLI will have an indirect effect on lowering GHG emission intensity through informing and guaranteeing that the livestock products are produced | Ministry of Agriculture and Rural Affairs (MARA) has already developed national standards and guidelines for the certification of green/organic agro-products, which have been adopted for used in all provinces. Eligibility for the green/organic/low-emission certificate takes place when only the relevant green/organic/low-emission technologies and practices are applied along the relevant product's value chain. All green/organic/low emission certifications have or will have low carbon/low emission, climate resilience, and sustainable use of natural resources criteria built in their standards. They will |

| DLI | DLRs | Allocated Amount (US$) | As a % of Total | Rationale for Selection | Critical Path Toward the Implementation of the DLI |
|---|---|---|---|---|---|
| | | | | in a sustainable and low-emission manner. The added value of these products will encourage more producers to switch to low-emission technologies and practices. | also have criteria supporting climate change adaptation such as comfortable sheds, proper ventilation, use of locally grown fodder, organic fertilizer, etc. |
| **Total IBRD loan** | | **200,000,000** | **100.0** | | |

39. **DLI verification.** The details on the DLIs and their verification protocols are presented in Annex 1. The verification of the achievement of the DLIs/DLRs, including the beneficiary satisfaction survey, will be carried out by a third-party verification entity (VE), hired by the provincial authorities at the outset of the Program implementation. The implementation of the DLIs will be monitored by the PPMO at the provincial level, based on the reporting by the county Program Management Offices (PMOs), which will be aggregated at the provincial level and verified by the VE. Awareness of the overall Program implementation at the county and provincial levels, indicative timelines, and specific steps to be taken at the county level will facilitate a smooth verification process. The PPMO will submit to the World Bank the relevant evidence of the total or partial achievement of DLIs. The World Bank will review the evidence provided and inform the PPMO of the conclusions regarding the fulfillment of the DLIs and the corresponding level of disbursement for each DLI. On that basis, disbursement requests will be submitted to the World Bank by the Provincial Department of Finance (PDOF). A copy of the World Bank's communications confirming the DLI achievement should be attached to the disbursement requests. The scalability approach and handling of financing of partially achieved or not achieved DLRs is described in paragraph 43.

## III. PROGRAM IMPLEMENTATION

### A. Institutional and Implementation Arrangements

40. **DARA of Gansu province will be the lead implementing agency** and will host the PPMO, which will be responsible for (a) taking the lead in the day-to-day management of the Program activities at the provincial level, (b) guiding the work of and providing technical assistance to the participating counties toward the achievement of the DLIs, (c) hiring the VE, (d) ensuring overall M&E for the Program, and (e) implementing DLI#5 and DLI#6, in close collaboration with the Program Counties. At the county level, Bureaus of Agriculture and Rural Affairs in the participating counties will be the lead implementing agencies. The county-level DARA will be responsible for implementing the PforR activities to achieve the relevant DLIs. Adequately staffed and resourced county-level Program Management Offices (CPMOs) will be set up in each county, to ensure successful implementation of the PforR and full achievement of the Program objectives.

41. **The Program Steering Committee (PSC) at the provincial level and Program Leading Groups at the county level will support coordination among the government agencies during the Program implementation**. The participating agencies at the provincial and county levels will include the Development and Reform Commissions, the Finance Department/Bureau, the Department/Bureau of Agriculture and Rural Affairs (DARA), the Department/Bureau of Natural Resources, and the Department/Bureau of Ecology and Environment. The PSC members will be appointed before Program effectiveness. In addition, the PPMOs will be supported by a Joint Expert Group (JEG) in the province. The JEG will consist of experts in livestock management and other relevant areas. The JEGs will provide support to the PPMO on technical issues during Program implementation. The JEG members will be appointed before Program effectiveness.

### B. Results Monitoring and Evaluation

42. **Each county will prepare an M&E plan, specifying the units of measurement, baseline values, targets, data sources for each Results Framework indicator, methodology, and responsibility for collection and reporting.** The results framework defines and provides details and parameters of each indicator, including the DLIs. Any additional details on the M&E plan and a tailored expenditure and financial reporting system will be prepared and included in the Program Implementation Plan (PIP). The two levels of PMOs (PPMO and CPMOs) will be responsible for the M&E of the

implementation progress and results of the Program activities and the PAP actions, with the CPMO carrying out M&E at the county level and reporting the results to the PPMO for consolidation and reporting to the provincial authorities and the World Bank. Existing government systems based on the relevant technical guidelines applied by authorities will be used for results measurement. Reporting on the Program will be consolidated by the PPMO based on reports from the CPMOs and will be submitted to the World Bank semiannually. Technical assistance will be provided by the PPMO and its technical experts to the program counties in monitoring and reporting during the implementation stage. The PPMOs will prepare and submit semiannual progress reports, M&E reports, Midterm Review (MTR) report, and a Program Implementation Completion and Results Report (ICR) at the Program closing. Findings of the M&E reports should be reflected in the relevant semiannual, MTR, and/or ICR report. The PforR Program DLRs will be monitored and verified by an independent VE. The third-party VE will be selected competitively, immediately after the PforR becomes effective, using TOR satisfactory to the World Bank.

### C. Disbursement Arrangements

43. **The Program funds will be disbursed upon verification of the achievement of the specific DLRs indicated under each DLI.** The submission and verification of results is outlined in Annex 1 of the PAD. Scalability of disbursements for partially achieved DLRs will be applied on a case-by-case basis, subject to availability of funds for those partially achieved results. Reallocation of any resources that may become available under the Program as a result of partial achievement of the DLRs will be determined by the decision of the World Bank in consultation with the PSC. Reallocation of the funds between DLIs is subject to the formal Program restructuring. Disbursements under the DLIs will be made as a share of the allocated amount. For results not achieved, or partially achieved, by the due date in each year of the Program, the allocated amount outstanding would be carried over to subsequent years and disbursed upon full achievement of the DLRs. The DLRs under the Program are not time-bound, the timelines for the achievement of the DLRs are indicative.

44. **Advance and prior results.** Up to 30 percent of the IBRD Loan amount may be disbursed as an advance and for achievement of prior results (or, up to 25 percent either as an advance, or as achievement of prior results). The World Bank will advance up to 20 percent (up to US$40 million equivalent) of the total IBRD loan amount to Gansu Province upon Loan Agreement being declared effective. Upon achievement of the DLIs against which the advances will be disbursed, the amounts of the advances will be deducted from the total amount to be disbursed against such DLIs. The World Bank will record any amounts of advance as disbursed for an achieved Disbursement Linked Result (DLR) (‘recovered’) after it has notified the Borrower of its acceptance of the evidence of achievement of the results for which the advance was provided. Additionally, up to ten percent of the IBRD Loan may be disbursed against achievement of prior results under any of the agreed DLIs.

### D. Capacity Building

45. **There is no stand-alone technical assistance component under this PforR.** However, capacity building and technical assistance are necessary at the provincial and county levels and will be ensured by the provincial experts from the government departments and academia. At the provincial level, capacity building will be needed for establishing governance and incentive system for the scale-up of sustainable low-emission livestock technologies and practices and for the development of related technical standards (development and adoption of the relevant standards and manual of low-emission technologies in livestock sector are PAP actions). Relevant experts (through the expert panel) and consultants will provide advice and support. An experienced technical support team will be engaged to assist with the implementation (PAP actions, fiduciary, Environmental and Social Framework, M&E, and technical matters).

46. At the county level, technical support and expert advice will be provided for tracking GHG emissions in livestock production systems, and certifying livestock products with green and organic/low-emission indications. Technical assistance may also be required to empower women's participation and leadership in Program-related activities. For instance, to support the PAP action of implementing a mentorship program, female leaders from livestock cooperatives and family farms will be connected with emerging leaders and low-emission technology experts. This is expected to bolster women's leadership and management skills and enhance women's leadership roles in TLPEs. The above capacity building and technical assistance interventions (including support from the World Bank team) will serve as mitigation measures to reduce the risks associated with the technical design of the Program and institutional capacity for implementation. Additionally, the Environmental and Social Systems Assessment (ESSA) has identified capacity building needs for: (i) strengthened monitoring mechanisms on Program beneficiaries composition and distribution of benefits, and strengthened engagement and grievance redress management systems; and (ii) strengthened environmental protection, animal and zoonotic disease prevention, animal welfare management, and health and safety (OHS) procedures in relation to livestock farming facilities operations.

## IV. ASSESSMENT SUMMARY

### A. Technical (including program economic evaluation)

47. **Overall, the government program is assessed as sound and relevant for improving livestock sector productivity.** It aims to support agricultural (including livestock) producers of all sizes, including cooperatives, to ensure increased incomes. The PforR is aligned with selected results of the focus areas while enhancing the program's focus on lowering emissions from livestock production systems (see Annex 2).

48. **The technical assessment confirmed the relevance of the DLIs, Program boundary, Program activities, and their rationale to the achievement of the PDO of the PforR.** Overall, the Program focuses on reducing GHG emissions of the province's livestock sector through sound expert technical solutions while incorporating international best practices. The Program will strengthen the provincial government existing system for uptake and scale-up of the low-emission and more climate resilient livestock production technologies. The results to be achieved under the Program are expected to lead to increased adoption of sustainable and low-emission technologies and practices, which lead to improved productivity, resource efficiency, and lower emissions from the livestock sector. Additionally, the Program's support for the development of an adequate MRV system to be implemented in the participating counties helps to prepare Gansu for potential future carbon financing opportunities. Use of digital tools, including remote sensing, can enhance the precision of the MRV system and reduce the cost of its management.

49. **The economic assessment confirms the viability of the proposed Program.** The Program economic assessment compares a scenario of 'no Government program' to a scenario with the Government program, including the World Bank's support. This approach is used because, under the Program, the Government and the World Bank's funds are co-mingled to achieve results, with no distinction at the activity level between the Government-financed and World Bank-financed achievements. This approach can determine whether the overall program, which the World Bank is partly financing, is beneficial after considering economic benefits and costs. Given the wide range of the program's interventions, the economic assessment has been carried out by each RA and flows of benefits and costs are projected over a 20-year period to estimate their economic rate of return (ERR). The ERR is calculated under three scenarios: (a) GHG reductions with low carbon shadow price, (b) high carbon shadow price, and (c) without GHG reductions, all with a discount rate of 6 percent. For RA1, the ERR with GHG reductions is estimated at 20 percent with low carbon shadow price; 27 percent with high

carbon shadow price; and ERR without GHG reductions at 13 percent, which indicates that the supported technology solutions are economically viable on their own. The RA2 will create an enabling environment for implementing the Program and enhance the impact of activities under RA1. It will help upscale low emission agricultural development and improve rural public service province-wide in the future, which is exceeding the Program's scope. The RA2 benefits are therefore counted in the economic analysis for RA1, and hence no separate analysis is needed.

50. **At the TLPE level, the economic and financial analysis confirmed that the investments in the PforR**-promoted low emission technologies and practices will result in increased productivity and profitability (Table 1) for the participating TLPEs. Additionally, as the TLPEs will be able to benefit from the sale of emission reductions generated by these investments upon re-opening of the carbon markets for agriculture, these could bring additional cash-flows for the TLPEs (see Annex 2 for additional information).

51. **Paris Alignment (PA).** The operation is aligned with the goals of the Paris Agreement on both mitigation and adaptation and resilience. For more details on the PA, please see Annex 2.

52. **CCB.** The Program is expected to generate CCB from both mitigation and adaptation either directly or indirectly. From the mitigation side, the Program will support achievement of lowering of emissions in the livestock sector by promoting adoption of low-emission technologies and practices in livestock farms. From the adaptation side, the Program will strengthen climate resilience through improved soil health, water conservation ability, improved animal health, breeding, and adoption of climate-resilient and low emission technologies on farms. In addition, the improved enabling environment would encourage the transition towards low-emission development pathways beyond the targeted Program areas, generating broader and long-term effects of CCB.

53. **GHG accounting.** The core objective of the Program is to reduce GHG emissions, including methane, from the livestock sector through adopting low-emissions technologies and practices. It is estimated that the GHG emissions from the 700 TLPEs could be reduced by 67,858 $tCO_2$-e at MTR stage, and 78,310 $tCO_2e$ annually by the PforR closing. These estimates are built on the scenario of '*with versus without*' the Program (see Annex 2 for details).

54. **Gender.** A comprehensive gender assessment on the current state of gender equality in the livestock sector was conducted across the Program counties in Gansu. The assessment concluded that there is a persistent gender gap and underrepresentation of females across all organizational types in the livestock sector, including economic organizations, agricultural enterprises, livestock production entities, and provincial institutions. The findings reveal nuanced challenges across various facets, including entrepreneurship and institutional leadership roles, wage differences, and technical roles in farming activities. These results underscore the necessity for targeted interventions to address these disparities and promote gender equity in the livestock sector. A strategic alignment with the recently published *Framework for Gender Responsive Livestock Development*, developed by the FAO, International Livestock Research Institute, Consultative Group for International Agricultural Research, International Fund for Agricultural Development, and the World Bank, will be instrumental in guiding these efforts. This framework offers specific approaches for increasing agency and leadership among women in the sector and will significantly inform and strengthen the Program's actions.

**55. Achievement of the proposed results under the Program requires its activities to address gender gaps and enhance gender equality in the livestock sector in Gansu.** The Program's results will be achieved through the implementation of the following activities designed to reduce the gender gap: (a) establishing and implementing a mentorship program to connect female members of livestock cooperatives and family farms with aspiring leaders and low-carbon technology experts; (b) facilitating personalized mentor-mentee pairings, focusing on leadership skills, teamwork, and strategic decision-making; and (c) organizing regular group activities, workshops, and networking events

to foster communication and interaction (see the Technical Assessment for further details). An indicator measuring the increase in the percentage of women in leadership positions in the 700 TLPEs has been included in the Results Framework.

56. **Maximizing Finance for Development (MFD) is a guiding approach for the Program design and implementation,** as private sector investments will be needed for the uptake of new technologies and value chain development. Private sector co-investments in the Program-promoted low-emission technologies are made by farmers and agri-businesses under RA1, including for the upgrade of value chains to enhance their operations toward receiving green/low-emission/organic product certificates. Such private investments will be counted toward MFD. In addition, under RA2, the Program will also contribute to strengthening the enabling environment and governance system; opening the door for the private sector to invest in advanced low-emission livestock technologies; and scaling up these technologies through partnerships with professional farmer cooperatives, extension services, and other service providers.

57. **Citizen engagement.** The Program has a strong citizen engagement aspect in its design and will benefit from citizen feedback monitoring throughout the implementation. During the preparation, the Program carried out stakeholder consultations with civil society, academia, and other relevant stakeholders, and their feedback were duly incorporated into the design. The Program implementation includes mechanisms to engage citizens, beneficiaries, and stakeholders, carrying out meaningful stakeholder consultations through focus group surveys; employing monitoring mechanisms such as satisfaction surveys, grievance redress mechanisms, and multi-stakeholder forums; and deploying tools for remote consultations. It also includes a citizen engagement indicator in the results framework, measuring the satisfaction of the beneficiaries with the Program's investments and performance.

**Expenditure Framework Assessment**

58. **The Gansu government expenditure framework provides a credible boundary for the Program.** Government budgets for the PforR Program's expected outcomes are sufficient, and there are no significant concerns about their fiscal sustainability. The transfers that the Program Counties received from the central and provincial governments are stable and predictable. The Expenditure Framework Assessment (EFA) showed that, during 2020–2022, a total of US$412.4 million was spent under budget lines relevant for the PforR. The expenditures relevant to RA1 and RA2 accounts for 88.5 and 11.5 percent, respectively (Table 6). The majority of public funds are directed toward activities under RA1 where results are achieved at the county level. The RA2 places a greater emphasis on system enhancement and institutional strengthening at the provincial level, which does not require significant budget resources. Consequently, the EFA primarily centers on the budgets and expenditures related to the Program activities under the RA1, focusing on increasing sustainability and reducing emissions from the livestock sector (see the Technical Assessment for a full analysis).

**Table 6. Program Government Financing by RAs, Actual during 2020–2022 and Projection for 2024–2030**

| Ras | 2020–2022 Actual | 2024–2030 Estimated[a] | |
|---|---|---|---|
| | Amount (US$, millions) | Amount (US$, millions) | Share (%) |
| RA1 | 364.9 | 729.9 | 88.5 |
| RA2 | 47.5 | 94.9 | 11.5 |
| **Total** | 412.4 | 824.8 | 100.0 |

*Note:* a. The estimate for 2024–2030 has been achieved by averaging the annual expenditures during 2020–2022 and forecasting the relevant expenditures during the six Program years 2024–2030. Detailed expenditures during 2020–2022 are in the TA.

59. **Expenditure performance and financial sustainability.** The quality of Program expenditure management will be critical to achieving the PforR objectives. While the county governments are responsible for delivering the results, the provincial level government is responsible for providing funds as well as subsidies to the Program counties through: (a)

earmarked transfers that mandate program counties to use the funds for activities which are critical to the achievement of expected results; (b) expenditure performance evaluation and rewards; and (c) technical guidance and close supervision. Co-financing for the program is expected to be stable, and the Program poses relatively limited risk to fiscal sustainability. Gansu's budget relies significantly on central government transfers, which accounted for 78 percent of revenues in the provincial general public budget (GPB) in 2022 (the latest available data). Central government transfers are a stable source of funding and have been somewhat countercyclical in recent years, growing faster in years with slower provincial GDP growth. Furthermore, funding for the program will be allocated from earmarked transfers (as opposed to general transfers), which will ensure that funding is stable and reliable. Finally, the total annual expenditures relevant to the Gansu PforR Program have been small, equivalent to 0.8 percent of Gansu's annual GPB revenue during 2020 – 2022. Given that the provincial budget is expected to remain flat during the next three years, it is expected that the PforR-related annual financing will remain less than one percent of the annual GPB revenue.

60. **The PforR will support repurposing traditional subsidy programs towards green incentives to support low emission livestock development.** The recent agriculture public expenditure analysis[40] shows that China has a historical track record of adjustments and optimization of fiscal support for agriculture. The Government of China and provincial governments have gradually moved their direct agriculture subsidy program towards green and ecologically oriented system of agricultural subsidies over the past 15 years, particularly for reducing agriculture-related point source environmental pollution and curbing the overuse of fertilizer. Gansu has been following the same trend. During 2020-2022, the general budget for agriculture, forestry and water was reduced by 11.1 percent, while the allocations for environmental programs increased by 22.9 percent. It is, therefore, expected that after the PforR closes, incentive for the scale-up of the new green and low emission livestock technologies, if warranted, would be budget-neutral as the provincial government would continue to repurpose some of its less efficient subsidy programs towards green and low emission livestock sector development programs, guided by the assessment of outcomes of the pilot under the DLI#6.

### B. Fiduciary

61. **Adequacy of the Program's fiduciary systems.** The Fiduciary Systems Assessment (FSA) concludes that the systems provide reasonable assurance that the Program's financing proceeds will be used for the intended purposes, with due attention to the principles of economy, efficiency, effectiveness, transparency, and accountability subject to agreed mitigation measures summarized in the Risk section (Section V). The procurement profile of the program includes goods, works, and consulting services required for program implementation. Contracts' sizes vary from US$0.5 to US$10 million and in aggregate are expected to be US$800 million annually and will involve multiple approaches from direct contracting to open national competitive procurement. The Program does not include activities with a contract value at or above US$115 million for works/supply and installation of plant/public-private-partnership and US$75 million for goods/information technology/non-consulting services, and US$30 million for consultant services. More details regarding the financial management (FM) and procurement aspects of the Program are reflected in Annex 3 and in the FSA.

62. **Fraud and corruption (F&C).** Arrangements to prevent, report, investigate, and act on F&C are in place at multiple levels of government. No allegations of F&C in participating agencies were reported over the last three years. While this is welcome, it does not provide sufficient confirmation of (a) public awareness of these arrangements, (b) the confidence in their credibility, (c) the quality of their tracking and recording of F&C cases and actions, and (d) that they can effectively provide the F&C reporting required by the World Bank. The Program will therefore support continued public education

[40] Towards Greener China: A Review of China's Recent Agricultural Support Policies and Public Expenditures. Unpublished draft. Kevin Chen and Yumei Zhang, May 2021.

about these arrangements and require reporting to the World Bank of F&C allegations. The Program will be subject to the World Bank 'Guidelines on Preventing and Combating Fraud and Corruption in Program-for-Results Financing', dated February 1, 2012, and revised on July 10, 2015 (the Anti-Corruption Guidelines). These guidelines shall be applied in an unrestricted manner to all activities within the Program boundary.

63. **Fiduciary supervision.** The Program procurement and FM arrangements are subject to annual audit by government audit offices. Procurement following the procedures of the Tendering and Bidding Law is subject to regular supervision and oversight by Development and Reform Commissions at various levels and relevant sector authorities. The Finance Department or Bureaus at various levels exercise regular supervision and oversight for procurement following the procedures of the Government Procurement Law.

### C. Environmental And Social

64. **An ESSA has been conducted to evaluate the soundness of applicable environmental and social (E&S) systems**. A combination of approaches was applied for the assessment, and stakeholders were consulted in all Program counties. Overall, over 380 relevant stakeholders were consulted for the ESSA process, of which over 30 percent were female. The following has been carried out: (a) screening and assessment of the potential E&S risks and impacts from the activities to be supported under the PforR; (b) review on the E&S laws, regulations, and procedures related to managing the E&S risks and impacts associated with the PforR activities at the provincial, and local levels; (c) field visits to sites of PforR activities in the selected counties;-(d) meetings and interviews with key stakeholders, including government officials at provincial, county, township, and village levels, representatives of local communities and livestock enterprises; (e) focus group discussions in 8 ethnic minority concentrated villages with 167 villager representatives; and (f) a sample survey of 43 of the 700 TLPEs in all seven Program counties that led to the: (i) development of a socio-economic profile including the key operational characteristics of the Program beneficiaries; (ii) analysis of the social risks related to vulnerable groups including ethnic minorities relevant to the proposed livestock operation, and (iii) analysis of how the Program would affect and engage with different stakeholder groups, and assess the ability of the government to engage with the target beneficiaries (see Annex 4 and the ESSA for details). These surveys and discussions with stakeholders provided a good understanding of the potential E&S risks associated with the PforR and the procedures and systems required to mitigate and monitor such risks and impacts.

65. **Overall, the Program is expected to bring broad and significant E&S benefits.** It will significantly improve the regional eco-environment and the well-being of community residents through reducing pollutants and GHG emissions, and promoting animal health, improving livestock husbandry resilience against climate shocks, and enhancing livelihood sustainability for farmers. E&S screening was conducted to exclude activities with a potential to cause significant adverse impacts that are sensitive, diverse, or unprecedented on the environment and people. The ESSA confirmed that no high-risk E&S activities would be supported under the PforR. Excluded activities are: artificial forage cultivation with high water consumption; acquisition or occupation of permanent farmland; and activities which may have adverse impacts on ethnic minorities, such as relocation, major changes in production and lifestyle.

66. **The overall E&S risks and impacts associated with these PforR activities are deemed to be Substantial.** During the Program operation, new facilities, or existing facilities on which the technologies and practices will be adopted may pose some environmental problems, including solid waste, wastewater, hazardous materials, endanger farmland ecology, spread of pathogenic microorganisms, and bring risks to workers and public health; fodder production may use excessive water, depleting ground water, and application of pesticides and fertilizers could lead to the agricultural NPS pollution and soil compaction. There are potential health and safety risks in excavation, and driving machinery and vehicles, etc.

during construction, and occupational health and safety (OHS) hazards in the day-to-day operations of livestock breeding and farming, use of pesticides, zoonotic infectious diseases during operation. The use of prohibited antibiotics, "clenbuterol" or other drugs in feed, or the excessive use of trace elements could cause the residue of harmful substances remain in animal products, which will affect animal health, lead to high incidence of animal disease, reduce breeding efficiency, and affect the quality of agro-food products, which in turn will affect public health and safety of agro-food consumers. Labor impact: there are potential labor disputes and occupational health and safety risks to workers and to a lesser extent, communities during the project construction process. No issues related to forced labor or child labor, or SEA/SH cases were identified in the site surveys. During the construction of related facilities, the entry of external construction workers into the community could potentially pose a risk of spreading infectious diseases. The wastewater, waste gas, solid waste generated during construction and operation, as well as the movement of machinery and vehicles, may impact the daily life and road safety of surrounding communities. Land use: facility agricultural land use (FALU), land use right transfer (LURT), upgrading and renovation of existing facilities and temporary land use (TLU) are expected to be involved. Livelihood impacts: land use like FALU and LURT will have limited impacts on farmers and herders' livelihoods, as land leasing fees are negotiated and paid annually to the owner of land contract rights by land users based on market price. Overall, livelihood impacts can be expected to improve for the workers, contractors, and owners of the TLPEs in the Program as a result of improved livestock productivity. There will be regular monitoring and assessment of implementation of stakeholder engagement activities. Ethnic minorities, vulnerable groups, and employees of the TLPEs will be proactively involved in the Program (and monitoring) to ensure their needs are addressed.

67. Adverse E&S impacts are neither significant nor irreversible and can be identified, avoided, minimized, and mitigated through known and demonstrated technologies and good management practices. However, given the varieties of activities to be supported in the Program counties, the likely adverse E&S effects risk is considered Substantial. Sunan county has a large population of ethnic minorities and some ethnic minority concentrated townships and villages are involved in the PforR geographic boundary. No activities are anticipated within the scope of the Ecological Conservation Red Lines, although there are natural reserves in the Program counties. Compared to enterprises, cooperatives and family farms may face more challenges in livestock farming development. There is a potential risk of uneven benefit distribution; and gaps in existing information disclosure channels and GRMs. As such there is a need for improving and diversifying information delivery channels to farmers, such as written manuals, electronic information dissemination through online platforms, specific promotion and awareness raising to different target vulnerable groups like women, ethnic minorities and older people.

68. The ESSA identified the need to prepare and implement an environmental and safety code of procedures (ESCOP). The environmental and sanitary conditions in some livestock production entities can be poor due to inadequate manure treatment and animal disease control facilities, and some facility operators could exhibit a lower adoption rate of health and safety practices. Additionally, environmental protection management measures due to inadequate operational procedures and internal management systems could be supervised and inspected inadequately by health authorities.

69. **The Program will strengthen engagement and grievance management system for beneficiaries and workers with focus on vulnerable groups**. Although existing information disclosure channels and GRMs are functioning, there is scope for improving and diversifying information delivery channels to farmers, such as written manuals, electronic information dissemination through online platforms, specific promotion and awareness raising to different target groups like women, ethnic minorities, older people, etc. Further, there is a need for the identification and management of E&S risks and impacts as well as public consultation and information disclosure in relation to construction and operation of some facilities. The potential risk of uneven benefit distribution will be further identified and managed via stakeholder engagement actions, GRM implementation, and regular supervision and monitoring. There is a potential risk that social benefits do not improve over time. To ensure that all TLPEs, regardless of farm size and structure, gender, and ethnicity,

equally benefit from the Program, there is a need to establish a monitoring system to monitor benefits across the Program in order to take corrective measures if required.

70. **Agreed risk management actions** include the following: i) Document cases of the good practices and experiences of controlling pollution from livestock production, preventing and controlling animal and zoonotic diseases and animal welfare, sharing with TLPEs guidance to prepare appropriate Environmental & Safety Code of Procedures (ESCOP); ii) Strengthen the publicity, education, supervision and management of the prevention and control of animal and zoonotic diseases, health and safety, animal welfare and environmental protection training and management of the operators of cooperatives and large family farms; iii) Strengthen engagement and grievance management system for beneficiaries and workers with focus on ethnic minority people and women, and E&S risks management in general; and iv) Develop Social Benefit Monitoring system to monitor beneficiary composition and distribution of benefits.

71. **Grievance redress.** Communities and individuals who believe that they are adversely affected as a result of a Bank supported PforR operation, as defined by the applicable policy and procedures, may submit complaints to the existing program grievance mechanism or the Bank's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address pertinent 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 at any time after concerns have been brought directly to the Bank's attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the Bank's Grievance Redress Service (GRS), visit https://www.worldbank.org/GRS. For information on how to submit complaints to the Bank's Accountability Mechanism, visit https://accountability.worldbank.org. The Program-specific GRM is detailed in Annex 4.

## V. RISK

72. **While most risks have been rated as Low or Moderate, the overall risk rating for the proposed Program is Substantial, given the Substantial rating of the Environmental and Social risks**. E&S screening has been conducted to exclude high-risk activities with the potential to cause significant adverse impacts that are sensitive, diverse, or unprecedented on the environment and/or people. Identified typical E&S risks under the Program include temporary and site-specific risks and impacts of dust, noise, waste, vegetation and habitat disturbance, soil erosion, land use, labor and OHS issues during construction relating to recruitment of temporary labor from surrounding communities, lack of access to Grievance Redress Mechanisms, inequitable benefit sharing, discharge/emission of various wastes, endangerment of farmland ecology and biodiversity, spread of pathogenic microorganisms, animal and zoonotic diseases, community and public health and safety risks/impact during the operation of the constructed facilities and application of technologies promoted and some downstream E&S impacts induced by non-physical activities.

73. The Program has been designed to proactively manage E&S risks, with clearly defined program boundaries and voluntary participation of the targeted beneficiaries. In order to manage potential E&S risks related to the Program, a multi-layered approach to the PforR supervision has been designed, including: (i) geographical targeting of supervision activities, with visits to all seven counties at least once annually; (ii) regular random selection of the TLPEs for impact and risk assessment by selecting at minimum 5-6 TLPEs to visit in each county every year; (iii) recruitment of an international expert on social development issues in China to strengthen the task team's supervision capacity; (vi) regular socio-economic surveys of the TLPEs; (v) regular (every 6 months, starting 6 months after the Effectiveness) monitoring and

assessment of implementation of stakeholder engagement activities, and subsequent performance of the GRM and other safeguards aspects of the Program; and (vi) implementation of the following PAP actions within six months of effectiveness and reported semi-annually: Strengthening "Engagement, Feedback and Grievance Management" and "Social Benefit Monitoring" systems in the government and Bank programs. Neither Bank OP/BP 7.50 (Projects on International Waterways) nor OP/BP 7.60 (Projects in Disputed Areas) applies to the Program.

74. **The Technical Design Risk is rated Moderate.** The Program will introduce a number of technical innovations, which presents certain risks, such as: (a) several of the new productivity-improving and GHG emission-reducing technology and practice packages have not been previously available in China; (b) the development of a Measurement, Reporting and Verification (MRV) system for emission reductions from livestock-related activities will be the first in China's livestock sector; and (c) the achievement of the intended results depends on the willingness of the TLPEs to voluntarily adopt these new technologies and practices. However, these risks are expected to be well mitigated under the Program. The technical design of the Program has been supported by national and international experts, as well as a wide range of experts from the province, to ensure sound technical solutions. Such expertise will continue to be available during the Program implementation. Similarly, expertise and peer-review capacity, both international and national, will be available to support the MRV development. The Program-financed investments in new technologies and practices in the livestock sector will be supported by technical assistance and extension support. As indicated in paragraph 29, the new low emission technologies and practices are expected to increase productivity and incomes of the livestock sector participants. The additional price incentives from entering green/organic/low emission consumer markets, as well as the expected future income streams from the carbon markets would provide additional benefits for farmers, cooperatives and agro-enterprises to make investments in low-emission livestock sector.

## ANNEX 1. RESULTS FRAMEWORK MATRIX

### Program Development Objective(s)

The Program Development Objective is to improve productivity and lower methane emissions in selected livestock sub-sectors and enhance the governance system for greening the livestock sector in the Program Counties of Gansu Province.

### PDO Indicators by Outcomes

| Baseline | Period 1 | Period 2 | Period 3 | Period 4 | Closing Period |
|---|---|---|---|---|---|
| **Improve productivity of and lower GHG emissions from selected livestock sub-sectors** | | | | | |
| **Net GHG emissions (methane, nitrous oxide and carbon dioxide) per year under the Program (Metric tons/year)** | | | | | |
| Dec/2022 | Dec/2026 | Dec/2027 | Dec/2028 | Dec/2029 | Dec/2030 |
| 0 | n/a | n/a | - 67,858 | n/a | - 78,310 |
| **Increased productivity in selected livestock sub-sectors defined as increase in volume of production among the TLPEs (Percentage)** | | | | | |
| Dec/2022 | | | | | Dec/2030 |
| TBD | | | | | TBD |
| **Enhance the governance system for greening livestock sector in the Program Counties of Gansu province** | | | | | |
| **Enhanced governance system (technical guidelines, MRV system, incentive system and green product certification) achieved (Yes/No)** | | | | | |
| Dec/2022 | Dec/2026 | Dec/2027 | Dec/2028 | Dec/2029 | Jun/2030 |
| No | No | Yes | Yes | Yes | Yes |

### Intermediate Indicators by Results Areas

| Baseline | Period 1 | Period 2 | Period 3 | Period 4 | Closing Period |
|---|---|---|---|---|---|
| **RA1: Increased Sustainability, Productivity and Reduced Emissions from the Livestock Sector** | | | | | |
| **Hectares of area under sustainable fodder production in the Program Counties where at least three CSFPTPs are being consistently (i.e., every season or year, as required) applied (Hectare(Ha))** [DLI] | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Nov/2022 | Nov/2026 | Nov/2027 | Nov/2028 | Nov/2029 | Nov/2030 |
| 0 | 20,000 | 40,000 | 60,000 | 80,000 | 100,000 |
| **Number of unique Target Livestock Production Entities ("TLPEs") that have adopted at least four low emission technologies and practices from the Eligible Technology and Practices List (Number) [DLI]** | | | | | |
| Dec/2022 | Dec/2026 | Dec/2027 | Dec/2028 | Dec/2029 | Dec/2030 |
| 0 | 70 | 210 | 420 | 630 | 700 |
| **Reduced intensity of GHG emissions in the TLPEs (tons/per unit of output) (Text)** | | | | | |
| Dec/2022 | | | | | Dec/2030 |
| 0 | | | | | TBD w/baseline survey in the 1st year |
| **Share of treated and recycled livestock manure that meets effluent standards in the TLPEs (Percentage ) (Percentage) [DLI]** | | | | | |
| Dec/2022 | Dec/2026 | Dec/2027 | Dec/2028 | Dec/2029 | Dec/2030 |
| 80 | 82 | 84 | 86 | 88 | 90 |
| **TLPEs adopting improved animal health practices, specifically: (i) achieving vaccination rate against PPR, FMD and brucellosis of at least 90 percent; (Yes/No) [DLI]** | | | | | |
| Dec/2022 | Dec/2026 | Dec/2027 | Dec/2028 | Dec/2029 | Dec/2030 |
| No | Yes | Yes | Yes | Yes | Yes |
| ➢Number of TLPEs that have developed anti-microbial resistance ("AMR") plans (Number) [DLI] | | | | | |
| 0 | 100 | 200 | 300 | 400 | 500 |
| **Volume (tons) of treated and recycled livestock manure that meets effluent standards in the TLPEs (Text)** | | | | | |
| Dec/2022 | Dec/2026 | Dec/2027 | Dec/2028 | Dec/2029 | Dec/2030 |
| 668,000 | 681,360 | 694,987 | 708,887 | 723,065 | 737,526 |
| **RA2: Improved Governance System for Sustainable and Low Emission Livestock Sector Management** | | | | | |
| **Measurement, Reporting and Verification (MRV) systems for emission reduction in the livestock value chains (a) developed; and (b) utilized (Text) [DLI]** | | | | | |
| Dec/2022 | Dec/2026 | Dec/2027 | Dec/2028 | Dec/2029 | Dec/2030 |
| 0 | 0 | Develop | Use | use | use |
| **Incentive system for promoting low emission technologies in livestock value chains demonstrated, demonstration results evaluated, and a re-aligned incentive system elaborated (Text) [DLI]** | | | | | |
| Dec/2022 | Dec/2026 | Dec/2027 | Dec/2028 | Dec/2029 | Dec/2030 |
| No | Design | Design | Evaluate | Elaborate document for Realignment | Yes |
| **Increased Percentage of Women in leadership position in the TLPEs. (Percentage)** | | | | | |
| Dec/2022 | Dec/2026 | Dec/2027 | Dec/2028 | Dec/2029 | Dec/2030 |
| 10 | 10 | 15 | 15 | 15 | 20 |
| **Increase in the number of livestock product certificates in the TLPEs in compliance with green, organic or low-emission standards (Number) [DLI]** | | | | | |
| Dec/2022 | Dec/2026 | Dec/2027 | Dec/2028 | Dec/2029 | Dec/2030 |
| 0 | 0 | 10 | 25 | 35 | 50 |

| Beneficiaries satisfied with Program implementation (Percentage) | | | | | |
|---|---|---|---|---|---|
| Dec/2022 | Dec/2026 | Dec/2027 | Dec/2028 | Dec/2029 | Dec/2030 |
| 0 | 60 | 60 | 60 | 60 | 85 |

## Disbursement Linked Indicators (DLI)

| Period | Period Definition |
|---|---|
| Prior Results | from June 30, 2023 to signing |
| Period 1 | Year 1 |
| Period 2 | Year 2 |
| Period 3 | Year 3 |
| Period 4 | Year 4 |
| Period 5 | Year 5 |

| Baseline | Prior Results | Period 1 | Period 2 | Period 3 | Period 4 | Period 5 |
|---|---|---|---|---|---|---|
| **1:Hectares of area under sustainable fodder production in the Program Counties where at least three CSFPTPs are being consistently (i.e., every season or year, as required) applied (Hectare(Ha) )** | | | | | | |
| 0 | 0 | 20000 | 20000 | 20000 | 20000 | 20000 |
| 0.00 | 0.00 | 6,500,000.00 | 6,500,000.00 | 6,500,000.00 | 6,500,000.00 | 6,500,000.00 |
| DLI allocation | | 32,500,000.00 | | As a % of Total DLI Allocation | | 16.25% |
| **2:Number of unique Target Livestock Production Entities ("TLPEs") that have adopted at least four low emission technologies and practices from the Eligible Technology and Practices List (Number )** | | | | | | |
| 0 | 0 | 70 | 140 | 210 | 210 | 70 |
| 0.00 | 0.00 | 4,655,000.00 | 9,310,000.00 | 13,965,000.00 | 13,965,000.00 | 4,655,000.00 |
| DLI allocation | | 46,550,000.00 | | As a % of Total DLI Allocation | | 23.28% |
| **3:Share of treated and recycled livestock manure that meets effluent standards in the TLPEs (Percentage ) (Percentage )** | | | | | | |
| 80 | 0 | 82 | 84 | 86 | 88 | 90 |
| 0.00 | 0.00 | 6,040,000.00 | 6,040,000.00 | 6,040,000.00 | 6,040,000.00 | 6,040,000.00 |
| DLI allocation | | 30,200,000.00 | | As a % of Total DLI Allocation | | 15.1% |
| **4:TLPEs adopting improved animal health practices, specifically: (i) achieving vaccination rate against PPR, FMD and brucellosis of at least 90 percent; (Yes/No )** | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| No | false | true | true | true | true | true |
| 0.00 | 0.00 | 2,950,000.00 | 2,950,000.00 | 2,950,000.00 | 2,950,000.00 | 2,950,000.00 |
| DLI allocation | | 14,750,000.00 | | As a % of Total DLI Allocation | | 7.38% |
| ➢ 4.1:Number of TLPEs that have developed anti-microbial resistance ("AMR") plans (Number ) | | | | | | |
| 0 | 0 | 100 | 100 | 100 | 100 | 100 |
| 0.00 | 0.00 | 1,000,000.00 | 1,000,000.00 | 1,000,000.00 | 1,000,000.00 | 1,000,000.00 |
| DLI allocation | | 5,000,000.00 | | As a % of Total DLI Allocation | | 2.5% |
| **5:Measurement, Reporting and Verification (MRV) systems for emission reduction in the livestock value chains (a) developed; and (b) utilized (Text )** | | | | | | |
| 0 | No | No | Develop | Utilize | Utilize | Utilize |
| 0.00 | 0.00 | 0.00 | 13,000,000.00 | 13,000,000.00 | 0.00 | 0.00 |
| DLI allocation | | 26,000,000.00 | | As a % of Total DLI Allocation | | 13% |
| **6:Incentive system for promoting low emission technologies in livestock value chains demonstrated, demonstration results evaluated, and a re-aligned incentive system elaborated (Text )** | | | | | | |
| No | No | Design | Evaluate | Elaborate document for realignment | | |
| 0.00 | 0.00 | 8,333,334.00 | 8,333,333.00 | 8,333,333.00 | 0.00 | 0.00 |
| DLI allocation | | 25,000,000.00 | | As a % of Total DLI Allocation | | 12.5% |
| **7:Increase in the number of livestock product certificates in the TLPEs in compliance with green, organic or low-emission standards (Number )** | | | | | | |
| 0 | 0 | 0 | 10 | 15 | 10 | 15 |
| 0.00 | 0.00 | 0.00 | 4,000,000.00 | 6,000,000.00 | 4,000,000.00 | 6,000,000.00 |
| DLI allocation | | 20,000,000.00 | | As a % of Total DLI Allocation | | 10% |

## Monitoring & Evaluation Plan: PDO Indicators by PDO Outcomes

| **PDO Outcome: Livestock Productivity Increased** | |
|---|---|
| Increased productivity in selected livestock sub-sectors (beef, milk and mutton) defined as increase in volume of production among the TLPEs (Percentage) | |
| Description | This indicator measures the increase in productivity for the selected livestock sub-sectors as increase in the volume of production for milk (dairy) and meat (beef and mutton). The baseline will be taken in the 700 TLPEs at the PforR outset and tracked on annual basis. A separate sub-indicator will be tracked for each sub-sector by the PPMO and CPMOs, then weighted and combined for the indicator reporting purposes. Improvements in the efficiency of production will also be assessed by calculating the Output per Unit of Input, which will be derived by calculating the ratio of output (such as meat, milk) to input (such as feed, labor, or capital). |
| Frequency | Baseline, annual, end term |
| Data source | TLPEs and County DARA |
| Methodology for Data Collection | Records from the TLPEs and DARA |
| Responsibility for Data Collection | PPMO, Gansu DARA, Program counties, and M&E consultants |
| **PDO Outcome: Low GHG Emission Livestock Sector Promoted** | |
| Net Green-House Gas (GHG) Emissions (methane, nitrous oxide and carbon dioxide) per year under the Program (Metric tons/year) | |
| Description | This indicator measures the reduction of GHGs emission, comparing the changes in emissions between the BAU and the Program intervention. It accounts for methane ($CH_4$), nitrous oxide ($N_2O$), and carbon dioxide ($CO_2$) from livestock production, including from enteric fermentation and manure in the TLPEs. Net emission reductions are achieved through reduced emission of $CH_4$ from ruminants by improving animal feed digestibility and nutritional levels and by extracting $CH_4$ and $N_2O$ from manure mangement. |
| Frequency | Baseline, midterm, and end term |
| Data source | Conversion of quantity reduced and sequestered to carbon dioxide equivalent ($CO_2$-e) using IPCC-aligned coefficients provided by MARA; data compiled by Program counties using livestock MRV |
| Methodology for Data Collection | Following the MARA methodology (IPCC-aligned) before the MRV is available; and livestock MRV developed under DLI#5 starting year 3 of the Program. |
| Responsibility for Data Collection | PPMO, Gansu DARA, Program counties, and M&E consultants |
| **PDO Outcome: Governance system promoted for reducing emissions** | |
| Enhanced governance system (technical standards, MRV system, incentive system and green product certification) | |
| Description | This indicator measures establishment of the enhanced governance system for low-emission technology promotion. Such governance system consists of technical standards, MRV system (as described in DLI#5), incentive system (as described in DLI#6), and green product certification for value chains (as described in DLI#7). |
| Frequency | Annual |
| Data source | Documentations from PPMO and DARA; M&E reports |
| Methodology for Data Collection | Records from PPMO and DARA |
| Responsibility for Data Collection | PPMO |

## Monitoring & Evaluation Plan: Intermediate Results Indicators by Results Areas

| **RA1: Increased Sustainability, Productivity and Reduced Emissions from the Livestock Sector** | |
|---|---|
| Hectares of area under sustainable fodder production in the Program Counties where at least three CSFPTPs are being consistently (i.e., every season or year, as applicable) applied, as indicated in Part A of Annex 7 to the PAD. | |
| Description | This this indicator measures the fodder production area under sustainable, climate-smart practices where at least three CSFPTP (for example, no tillage, replacing inorganic fertilizer with organic, use of legumes, and reduced water use) are consistently applied. Consistently means every season or year, as applicable. This indicator is DLI#1; so, these areas will have to meet the requirements described in DLI#1. |
| Frequency | Annual |
| Data source | Report from VE |
| Methodology for Data Collection | Field monitoring following standard sampling and analysis methodology; records from counties and relevant provincial agencies such as Provincial DARA |
| Responsibility for Data Collection | DARA and Program counties |
| Number of unique Target Livestock Production Entities ("TLPEs") that have adopted at least four low emission technologies and practices from the Eligible Technology and Practices List | |
| Description | This indicator measures the number of TLPEs which follow and adopt any of the four or more technologies or practices that have been promoted through the Program. This indicator is DLI#2; therefore, the TLPEs will have to meet the requirements described in DLI#2. |
| Frequency | Semi-annual |
| Data source | Report from VE |
| Methodology for Data Collection | Records from target farms/cooperatives/enterprises in the Program Counties |
| Responsibility for Data Collection | DARA, PPMO, and CPMOs, with help from M&E consultants and third-party VE |
| Reduced intensity of GHG emissions in the TLPEs (Tons/per unit of output) | |
| Description | This indicator measures reduction of GHG emissions, including methane ($CH_4$), nitrous oxide ($N_2O$), and carbon dioxide ($CO_2$), per unit of outputs such as litre or kilogram through the use of LETPs adopted by the TLPEs. The results will be tracked for TLPEs and aggregated for reporting purposes. |
| Frequency | Annual |
| Data source | Semi-annual Program progress report |
| Methodology for Data Collection | Records from target farms/cooperatives/enterprises in the Program counties |
| Responsibility for Data Collection | DARA, PPMO, and CPMOs, with help from M&E consultants |
| Share of treated and recycled livestock manure in the TLPEs that meets effluent standards (Percentage) | |
| Description | This indicator measures the increased quantity of livestock manure that has been treated following the effluent standards in the TLPEs. This indicator is DLI#3; therefore, the TLPEs will have to meet the requirements described in DLI#3. |
| Frequency | Semi-annual |
| Data source | Report from VE |
| Methodology for Data Collection | TLPE and county reports, with help from the VE. |
| Responsibility for Data Collection | DARA, PPMO, and CPMOs, with help from M&E consultants and third-party VE. |
| Volume (tons) of treated and recycled livestock manure in the TLPEs that meets effluent standards (Metric ton) | |
| Description | Increased quantity of livestock manure from the TLPEs that has been treated following the effluent standards |

| | |
|---|---|
| Frequency | Semi-annual |
| Data source | Report from TLPEs and Counties; and VE |
| Methodology for Data Collection | Reports from TLPEs and County DARA |
| Responsibility for Data Collection | DARA, PPMO, and CPMOs, with help from M&E consultants and third-party VE |
| Number of TLPEs adopting improved animal health practices, specifically: (i) achieving vaccination rate against PPR, FMD and brucellosis of at least 90%; (Yes/No) | |
| Description | This indicator measures whether at least 90 percent of TLPEs have adopted improved animal health practices, mainly the vaccination rate against PPR, FMD, and Brucellosis. This is part (a) of DLI#4; therefore, the requirements described in DLI#4(a) will have to be met. |
| Frequency | Semi-annual |
| Data source | Report from VE |
| Methodology for Data Collection | Records from the Government's veterinary agencies and those of target farms/cooperatives/enterprises in the Program counties |
| Responsibility for Data Collection | DARA, PPMO, and CPMOs, with help from M&E consultants and third-party VE |
| Number of TLPEs developing antimicrobial resistance (AMR) management plans (Number) | |
| Description | This indicator measures the number of TLPEs which have developed and adopted a AMR management plans. This is part (b) of DLI#4; therefore, the requirements described in DLI#4(b) will have to be met. |
| Frequency | Semi-annual |
| Data source | Report from VE |
| Methodology for Data Collection | Records from the Government's veterinary agencies and target farms/cooperatives/enterprises in the Program counties |
| Responsibility for Data Collection | DARA, PPMO, and CPMOs, with help from M&E consultants and third-party VE |
| **RA 2: Improved Governance System for Sustainable and Low Emission Livestock Sector Management** | |
| MRV system for emission reduction in the livestock value chains: (a) developed; and (b) utilized (yes/no) | |
| Description | This indicator measures the MRV system development and use for emission reduction in the livestock value chains, following IPCC methodologies. This is DLI#5; therefore, the requirements described in DLI#5 will have to be met. The MRV system will be used to measure emission reductions at the MTR as part of its testing and verification process. |
| Frequency | Developed by the third year of implementation |
| Data source | Report from VE |
| Methodology for Data Collection | The MRV system will be developed in close collaboration with multidisciplinary teams from the provincial-level authorities and research and academic institutions. An expert panel will be established at the provincial level to oversee and peer review the MRV development process and outputs. |
| Responsibility for Data Collection | PPMO, Gansu DARA and Program counties, with help, as needed, from M&E consultants and VE |
| Incentive system for promoting low emission technologies demonstrated, demonstration results evaluated, and the re-aligned incentive system document elaborated (Yes/No ) | |
| Description | This indicator measures whether the incentive system has been aligned to strengthen the provincial government system for future uptake and scale-up of the low-emission and resilience-improving livestock production technologies and practices among the province's livestock sector participants. This indicator is DLI#6; therefore, the incentive system will have to meet the requirements described in DLI#6. |
| Frequency | Annual |
| Data source | Report from VE |
| Methodology for Data Collection | DARA/PPMO following consultative process among the relevant stakeholders at provincial and county levels |
| Responsibility for Data Collection | DARA, PPMO, and CPMOs, with help from M&E consultants |

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|---|---|
| Number of livestock product certificates with green, organic, or low-emission standards in the Program Counties (number) | |
| Description | This indicator measures the number of new certificates for adopting green or organic or low-emission technologies and practices as specified in the Verification Protocol for DLI#7. This indicator is DLI#7; therefore, the product certification will have to meet the requirements described in DLI#7. |
| Frequency | Semi-annual |
| Data source | Semi-annual M&E reports and VE reports |
| Methodology for Data Collection | Records from target farms/cooperatives/enterprises in the Program Counties. |
| Responsibility for Data Collection | Provincial Program Management Office (PPMO), and County Program Management Offices (CPMOs), with the help from M&E consultants |
| Increased Percentage of women in leadership position in TLPEs (Percentage) | |
| Description | This indicator measures the increase in the percentage of women in leadership positions in the 700 TLPEs. This includes farmers' cooperatives with at least one woman on the board of directors, women-headed family farms, and livestock enterprises entirely owned or led by women or where women hold key leadership positions. |
| Frequency | Semi-annual |
| Data source | Semi-annual Program progress report |
| Methodology for Data Collection | Official records of PPMO and CPMO and socioeconomic surveys |
| Responsibility for Data Collection | PPMO and CPMOs, with help from M&E firms |
| Beneficiaries satisfied with Program implementation (Percentage) | |
| Description | Program beneficiaries who are satisfied with the timely implementation of the Program addressing beneficiaries' needs and concerns, within the scope of the Program |
| Frequency | Annual |
| Data source | Survey results |
| Methodology for Data Collection | Official records of PPMO and CPMO and grievance redress mechanism system; satisfacion survey results |
| Responsibility for Data Collection | PPMO and CPMOs, with help from M&E firms |

## Verification Protocol Table: Disbursement Linked Indicators

| | |
|---|---|
| DLI#1: Hectares of area under sustainable fodder production where at least three CSFPTPs are being consistently (i.e., every season or year, as applicable) applied, as indicated in Part A of Annex 7 to the PAD. | |
| Formula | US$325 per ha (Target value: 100,000 ha; Total amount: US$32,500,000) |
| Description | This DLI aims to promote sustainable, climate-smart practices in fodder production areas by reducing environmental impact, improving efficiency, and adapting to climate change. Increased fodder production is expected to have a positive impact on natural grassland degradation in the province, supporting reduction in the demand for grassland carrying capacity. The DLI will contribute to both adaptation and mitigation through application of climate smart practices in fodder production areas. It is expected to enhance their ability to withstand climate-related stresses. To ensure that the fodder production area under new technologies and practices is eligible for inclusion under the DLI, at least three climate-smart agriculture (CSA) technologies and practices should be applied on a consistent basis (that is, every season or year, as applicable). The list of eligible agreed technologies and practices is indicated in part A of Annex 7 to the PAD. This DLI will be implemented at the county level. |
| Data source/ Agency | DARA and Program counties |
| Verification Entity | Third-party VE |
| Procedure | The third-party VE will review the records from the Participating Counties and the relevant provincial agencies such as Provincial DARA. 10 percent of the fodder production areas in the TLPEs reported and included in the verification would be randomly selected and visited in the field to verify the improved management of the fodder production areas and verify the records of application of at least three CSGMTP. In the fodder production areas outside of the 700 TLPEs, of the area reported and submitted for verification, at least 30 percent of the area would be randomly selected for in-person verification visit. If 10 or less percent of the verified random sample fails to meet the agreed technical standards, the non-compliant fodder production areas will be excluded from DLI disbursement calculations or can be replaced with other eligible areas. If more than 10 percent of the verified fodder production areas fail to meet the agreed technical standards, the DLR is considered as 'not achieved', and the entire submission will be subject to a new round of random verification, in addition to the random verification sample for the new achieved DLR.<br>Disbursements are scalable and are made to the counties against the area of fodder production where at least three additional CSGMTPs are being consistently applied. |
| DLI#2: Number of unique TLPEs in the Program counties that have adopted at least four additional low-emission technologies and practices from the agreed eligible technology and practices list, as indicated in part B to Annex 7 | |
| Formula | US$66,500 per farm (Target value 700 TLPEs; Total amount: US$46,550,000) |
| Description | This DLI aims to contribute to the GHG emission reductions in the Program-supported livestock sub-sectors by incentivizing TLPEs to follow low-emission technologies and practices promoted through the Program. It provides data for the incentive system result under DLI#6. This DLI excludes manure management technologies and practices, which are covered by DLI#4, and animal health measures, which are covered by DLI#5. Low-emission technologies and practices can include, for example, breeding low-emitting animals, growing low-emitting crops and grasses, using low-emitting feed additives, giving methane inhibitors to animals to suppress the methane-producing microbes in an animal's gut, and so on. A complete manual of the eligible low-emission technologies and practices, based on the list indicated in part B of Annex 7 of the PAD, will be developed by the PPMO during the first year of the Program implementation. TLPEs aiming to be included in the verification will be able to select any additional (additional to what is already being done) four or more, inclusive of emission reduction monitoring, practices, or technologies for implementation. The list of low-emission technologies and practices, in Annex 7 of the PAD, includes (a) precision feeding and nutrition, (b) animal genetics and breeding, (c) rumen modification, (d) animal health, (e) manure management, and (f) resource efficiency in value chains; No. B.19 is emission reduction monitoring. Any TLPE which has adopted technologies and practices of (a) + any other two from (b) and (c) + B.19 is deemed to be eligible for inclusion in the DLI result. (d) a (e) are excluded, as they are tracked under separate DLIs. and the baseline for TLPE emission intensity will be measured in the first year of the Program implementation. |
| Data source/ Agency | Records from target farms/cooperatives/enterprises in the Program counties or from DARA, PPMO, and CPMOs |
| Verification Entity | Third-party VE |

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| Procedure | Third-party VE checks the records from TLPEs in the Program counties or from DARA, PPMO, and CPMOs. The VE will visit 100 percent of the TLPEs to verify adoption of low-emission technology and practices. Additionally, a set of beneficiary satisfaction with the Program-related questions will be asked from each visited TLPE using a survey instrument acceptable to the Bank. As part of the beneficiary satisfaction survey, the third party VE will also review results of the Social Benefit Monitoring System, undertaken by the counterpart as a PAP. If 10 percent or less of the verified TLPEs fail to meet agreed technical standards, the non-compliant TLPEs will be excluded from DLI disbursement calculations, or can be replaced with other eligible TLPEs. If more than 10 percent of the verified TLPEs fail to meet agreed technical standards, the DLR is considered as 'not achieved' and the entire submission will be subject to a new round of verification, in addition to new random verification sample for the new DLR. The TLPEs that have adopted less than four low-emission technologies and practices will not be counted; similarly if the same TLPEs adopt another set of four technologies and practices, they will also not be considered for inclusion under the DLR achievement. Each TLPE will have to be unique.<br>Disbursements are scalable and are made against the number of livestock farms in a calendar year, which have adopted the new low-emission technologies and practices. |
| DLI #3: Share of treated and recycled livestock manure in the TLPEs that meets effluent standards. | |
| Formula | US$30,200 for each 0.01 percentage increase (Target value: 10 percent increase from 80 percent to 90 percent; Total amount US$30,200,000 ) |
| Description | This DLI contributes to the GHG emission reductions in the Program-supported livestock sub-sectors by increasing the share of livestock manure that is treated and recycled into organic fertilizer and other uses, thus contributing to the 14th FYP's comprehensive manure treatment targets. The DLI will directly reduce the methane and nitrogen emission from animal manure. It will indirectly contribute to adaptation given the manure could be made as organic fertilizer to improve soil health to better withstand climate stress. The cumulative data on the quantity of manure collected, treated, and recycled will be obtained from two sources: large TLPEs with on-site treatment facilities and centralized treatment facilities for medium-sized livestock farms. MARA has established a national platform for monitoring quantities of livestock manure produced, collected, treated, and utilized (for example, as organic fertilizer, conversion to biogas/energy, and crop irrigation). Data from this platform enable MARA and DARAs to scientifically calculate the comprehensive utilization rate of livestock manure. Supplementary data will be collected directly from the on-site ledgers of large- and medium-scale livestock TLPEs and through annual M&E socioeconomic surveys. |
| Data source/ Agency | Provincial and county DARA, TLPEs |
| Verification Entity | Third-party VE |
| Procedure | Data will be collected directly from the TLPEs and verified from random sampling of large- and medium-scale farms and the centralized manure treatment facilities and by reviewing other supporting documents, such as inspection reports from county DARAs and annual M&E socioeconomic survey reports. Livestock manure treatment and recycling targets and budgets are spread over 2024–2029 program implementation period. Third-party VE verifies the results and estimates the annual manure treatment rates.<br>Disbursement will be made against the proportion (percentage) of the target net tons of livestock manure collected, treated, and recycled that is achieved in the TLPEs in a calendar year. |
| DLI#4: Number of TLPEs adopting improved animal health practices, specifically: (a) vaccination rate against PPR, FMD and Brucellosis of at least 90 percent across all TLPEs; and (b) anti-microbial resistance (AMR) plans developed by selected TLPEs. | |
| Formula | US$2,950,000 per verification of vaccinations (5 annual verfications); US$10,000 per AMR plan (500 plans in total); |
| Description | This DLI contributes to the GHG emission reductions in the Program-supported livestock value chains by enabling improved animal health and welfare. Resulting in higher animal productivity, it is thereby lowering the emission intensity. This would also contribute to improved food safety in the livestock value chains as animal diseases could also be a potential source for new pathogens to emerge and spread from animals to humans. By improving animal health, livestock production becomes more productive and sustainable. The achievement of the DLI includes promoting practices aimed at ensuring that the livestock (cattle, sheep, and goats) vaccinations due in any given year are implemented at least at 90 percent and ensuring the AMR plan preparation. The plans at a minimum should cover promoting and raising awareness on responsible use of antimicrobials; enhancing animal welfare and disease prevention and control through improved animal husbandry practices; promoting alternative, non-antibiotic-based, disease management strategies; and strengthening the use of veterinary services which reduces the overuse of antibiotics in livestock production systems. |
| Data source/ Agency | Official records of PPMO and records from TLPEs the Program counties or from DARA, PPMO, and CPMOs |
| Verification Entity | Third-party VE |
| Procedure | Third-party VE checks the records from TLPEs in the Program counties or from DARA, PPMO, and CPMOs. VE randomly selects 10 percent of the TLPEs and visits those TLPEs to verify adoption of practices aimed at improving animal health |

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|---|---|
| | and welfare. The annual vaccination rate against PPR, Brucellosis, and FMD should at least reach to 90 percent. Any areas in the Program counties which are declared free of a certain disease and do not require any vaccinations will be excluded from the vaccination rate calculation; 90 percent have to be reached in the remaining areas. Similarly, if a certain vaccine is valid for longer than one year and do not require annual re-vaccination, these will be considered compliant with the annual vaccination requirements, provided that TLPEs maintain valid vaccination records.<br>At least 500 TLPEs (out of the 700 TLPEs under DLI#2) should have developed and adopted an AMR plan. Verification of the DLI is done annually. If 10 percent or less of verified random sample TLPEs fail to meet the agreed technical standards, the non-compliant TLPEs will be excluded from DLI disbursement calculations or can be replaced with other eligible TLPEs. If more than 10 percent of the verified TLPEs fail to meet agreed technical standards, the DLR is considered as 'not achieved', and the entire submission will be subject to a new round of random verification once the DLR is achieved, in addition to new random verification sample for the TLPEs submitted to achieve the next DLR.<br>Disbursements are scalable and are made against the number of TLPEs in a calendar year, which have adopted better animal health technologies and practices. |
| DLI#5: Measurement, Reporting and Verification (MRV) system for measuring emission reduction in the livestock value chains (a) developed and (b) utilized. | |
| Formula | US$26,000,000 per MRV (US$13,000,000 per step: Step 1: MRV development; Step 2: MRV piloting/testing in use; Total amount: US$26,000,000) |
| Description | This DLI will contribute to GHG emission reduction and climate change mitigation and adaptation by supporting the scale-up of low-emission and resilience-improving livestock production technologies and practices in the province. As part of strengthening of the regulatory and institutional enabling environment for the scale-up, the DLI supports the development and adoption of an MRV system for measuring, monitoring, reporting the emission reductions in the livestock value chains. Overall guided by DARA, the MRV development should be carried out in close collaboration with multidisciplinary teams from the provincial-level authorities and research and academic institutions. An expert panel will be established at the provincial level to oversee and peer review the MRV development process and outputs. The MRV will have to be developed following the methodology by IPCC to the extent applicable. The MRV system should be used for the emission reduction measurement as part of the MTR as part of its approbation process. |
| Data source/ Agency | PPMO, Gansu DARAand Program counties, with help, as needed, from M&E consultants |
| Verification Entity | Third-party VE |
| Procedure | Third-party VE verifies the MRV system for measuring, monitoring, reporting, and verifying emission reductions in the livestock value chains to make sure (a) the MRV system is developed in a collaborative and scientific manner, and (b) the MRV system has been peer-reviewed and cleared by the provincial-level expert panelThird-party VE verifies that the MRV system has been utilized as part of the Program's MTR by comparing the emission reduction methodologies. If the methodologies under during the MTR are inconsistent with those of the MRV system, it will be determined that the MRV system has not been utilized. |
| DLI #:6 Incentive system for promoting sustainable low emission technologies in livestock sector demonstrated, demonstration results evaluated, and the re-aligned incentive system elaborated. | |
| Formula | US$8,333,333 for each: Step 1and Step 2; US$8,333,334 for Step 3. (Total amount: US$25,000,000) |
| Description | Implemented at the provincial level, this DLI aims to contribute to GHG emission reduction and climate change mitigation and adaptation by supporting the adoption of low-emission and resilience-improving livestock production management technologies and practices. The DLI supports the piloting, assessing, and aligning of the uptake system (including incentives for adoption of livestock production technologies and practices which generate positive environmental externalities) to strengthen the provincial government's system for the uptake and scale-up of the low-emission and resilience-improving livestock production management technologies and practices among the province's livestock sector participants in the future. The pilot under the DLI#2 will provide results, feedback, and lessons learned for the uptake system and incentive realignment at the provincial level. This DLI will result in climate change co-benefits by encouraging adoption of sustainable and low-emission livestock value chain technologies and practices. |
| Data source/ Agency | DARA, PPMO and CPMOs |
| Verification Entity | Third-party VE |
| Procedure | Third-party VE will check relevant records and documentations to ensure that the realignment of the uptake and incentive program has followed these steps: (a) design of the pilot, which will be implemented under the DLIs#2; (b) preparation of an evaluation report on the pilot, including (i) the data on the implementation: number of beneficiaries and description of the investments made, (ii) estimated GHG emissions achieved, (iii) behavioral changes of producers, and (iv) |

| | |
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| | investment's impact on the beneficiaries, etc.; and (c) elaboration of the realigned incentive system program document, based on the results of the pilot. |
| DLI#7 Number of livestock product certificates in compliance with green, organic, or low emission standards in the Program Counties. | |
| Formula | US$400,000 per certificate (Target value: 50 certificates; Total amount: US$20,000,000) |
| Description | This DLI is part of the incentive system to promote the uptake of green, organic, or low-emission production practices and technologies. Types of certificates eligible for inclusion under the DLI include: (i) Green Certificate; (ii) Organic Certificate; (iii) Geographical Indication (GI)[41] which should include compliance with green, organic or low emission guidelines; (iv) HACCP[42]; (v) GANWEI (Gansu Flavor)[43]; (vi) Agricultural Product Quality Certification, ISO 14000 group[44]; (vii) Global GAP[45]; and (viii) Pollution-Free Food[46].<br>This DLI aims to incentivize adoption of sustainable low-emission technologies by providing them with market recognition and access to premium markets. It also helps ensure that livestock production follows environmentally friendly practices, such as sustainable fodder production and low-emission technologies.<br>The DLI will have an indirect effect on CCB through informing and guaranteeing that the products are produced in a sustainable and low-carbon manner. The added value of these products will encourage more producers to switch to low-emission technologies and practices in the future. Eligibility for the green/organic/low-emission certificate takes place when only the relevant green/organic/low-emission technologies and practices are applied along the relevant product's value chain. All new certificates received under the Program for adopting green or organic or low-emission technologies and practices are included in this DLI. |
| Data source/ Agency | Official records of PPMO, those of certifying agencies, and records from farms/cooperatives/enterprises in the Program counties or from DARA, PPMO, and CPMOs |
| Verification Entity | Third-party VE |
| Procedure | Third-party VE checks official records of the certificates from the certifying agencies in the Program counties and verifies all submitted certificates for their validity.<br>Actions taken for compliance with any of the certificates should also include greening of the value chain by applying low emission, organic or green technologies and practices, for the purposes of the Program.<br>Disbursements are scalable and are made against the number of certified livestock products in a calendar year, which have acquired or renewed certificates with green/organic/low-emission indications. |

[41] GI - a Geographical Indication - is a sign used on products that have a specific geographical origin and possess qualities or a reputation that are due to that origin.

[42] HACCP – Hazard Analysis Critical Control Point - is a management system in which food safety is addressed through the analysis and control of biological, chemical, and physical hazards from raw material production, procurement and handling, to manufacturing, distribution and consumption of the finished product.

[43] GANWEI (Gansu Flavor) - refers to characteristic and advantageous agricultural products that are based on green and standardized production, supported by agricultural product production area environmental monitoring and evaluation, nutritional quality testing and evaluation, and quality safety supervision and traceability systems.

[44] ISO 14000 group is Environmental Management Standards to help reduce environmental impacts, reduce waste and be more sustainable.

[45] Global Good Agricultural Practices (GAP) certification is a set of voluntary standards that ensures that agricultural products meet certain safety, quality, and sustainability criteria throughout the production process, including various aspects of farming practices, including crop production, animal welfare, environmental conservation, and worker health and safety.

[46] Pollution-free food certification is for safe, high-quality edible agricultural products that are produced in a good ecological environment and in accordance with green food standards, subject to full-process quality control, and have obtained the right to use the green food logo.

## ANNEX 2. (SUMMARY) TECHNICAL ASSESSMENT

1. **The Technical Assessment report evaluates the adequacy of the Program in the following areas:** (a) detailed sectoral context and Program description; (b) strategic relevance and technical soundness; (c) expenditure framework including expenditure scope, program financing, expenditure performance, and financial sustainability; (d) DLIs and M&E capacity; (e) Program economic evaluation; (f) PA and GHG emission estimation, as well as climate change mitigation and adaptation considerations in each DLI; and (g) gender assessment. As part of technical soundness, the report presents under each DLI existing weaknesses in the government system and how the DLI is going to address them while incorporating international best practices and the World Bank's experiences in China and other parts of the world that would contribute to meet the expected results and consequently achieving the PDOs (Table 2.1).

**Table 2.1: Assessment of the Strength and Weaknesses of the Government program and the PforR Support**

| Government program Strengths | GP's Areas for Improvement | PforR Program Support |
|---|---|---|
| Focus on industry transformation through technological modernization and commercialization. Strong R&D backing on technology development. | limited experience and adoption of green/low emission animal husbandry technologies and practices at local level. Weak extension and knowledge transfer. | Promote adoption of low-emission animal husbandry technologies and practices through technical advisory services (DLI#2) |
| Explicit focus to reduce livestock feed imports and enhance self-sufficiency in quality fodder. | Resource-intensive and poor quality of livestock fodder production. | Increase quality and quantity of fodder production (DLI#1) |
| Aim to expand animal health advisory services to grassroots levels. Consolidation of scattered small farms through coops for improved service delivery and reduced animal/zoonotic disease risk management. | Widespread use of antibiotics. Livestock diseases such as Brucellosis continue to pose a serious threat to the livestock industry. | Improve vaccination and health practices. Develop anti-microbial resistance (AMR) plans (DLI#4) |
| Manure tracking system available from larger farms, some manure, especially from larger farms, are treated, and the technological know-how exists. | Manure treatment still low, especially at cooperative and farm household levels, affecting animal health and environment. | Increase the share of treated manure (DLI#3) |
| Aim to benefit from China's voluntary carbon markets (once they resume for the agriculture sector). | Lack of standardized approach to MRV. | Develop MRV system (DLI#5) |
| Significant budget allocation for livestock production entities on the ground. | Support not explicitly targeted for lowering emissions. | Realign incentive system (DLI#6) |
| Gansu promoted green and organic certification scheme. | No consideration of lowering emissions through the certification systems. | Low emission certification established (DLI#7) |

2. **The Economic and Financial Analysis (EFA)** of the Program was carried out, assessing the economic and financial benefits and costs of the proposed PforR. The full EFA is attached in the Technical Assessment (Table 2.2).

**Table 2.2: Data on TLPEs, Animals and Emission Reductions**

| Administrative Unit | Number of Animals, total | Total number of LPEs in the province | Number of Animals in the large and medium LPEs | Number of large and medium LPEs | Emissions from large and | Emissions from large and | Methane reduction contribution from large |
|---|---|---|---|---|---|---|---|

| | Cattle | Sheep and goats | | Cattle | Sheep and goats | | medium LPEs Tons/CO2 e | medium LPEs as % of total emissions from LPEs | and medium LPEs, Tons/$CH_4$ |
|---|---|---|---|---|---|---|---|---|---|
| Gansu province | 5,100,000 | 24,400,000 | 439,200 | 1,5020,000 | 3,200,000 | 16,700 | 3,815,100 | 23.7% | 38,151 |
| 7 Program Counties | 344,000 | 1,186,000 | 36,600 | 137,600 | 355,800 | 2,000 | 363,900 | 37.2% | 3,636 |
| 700 TLPEs under PforR | 90,450 | 180,000 | 700 | 90,450 | 180,000 | 700 | 216,730 | | 2,167 |

3. **The economic assessment compares a scenario of "no government program" to a scenario of a government program, including the World Bank's support.** This approach is used because, under the Program, the government and Bank's funds are combined to achieve results, with no distinction at the activity level between government-financed and Bank-financed achievements. This approach can determine whether the overall program, which the Bank is partly financing, is viable after considering economic benefits and costs. Given the wide range of the program's interventions, the economic assessment has been carried out by RAs.

**Results Area 1: Increased Sustainability, Productivity and Reduced Emissions from the Livestock Sector**

4. **Economic analysis**: Cost-benefit analysis has been conducted to assess the economic viability of RA1 by aggregating activities to be implemented under three DLIs: in sustainable fodder production where at least three CSFPTPs are being consistently (i.e., every season or year, as applicable) applied ( 100,000 ha, see DLI#1), and low emission technologies and practices by the scaled livestock farms (DLI#2), covering 700 demonstration farms with 19,000 dairy cattle, 71,000 beef cattle, 173,000 sheep and 6,000 goats, and treated livestock manure (DLI#5), based on the physical targets to be achieved and models in financial analysis. The incremental economic costs include: (a) investment cost for technical package adoption, including costs for improved feed and feeding regime for livestock production, and investment cost for mature treatment facilities; (b) training and capacity-building costs; and (c) operating costs for livestock production and manure treatment. The major benefits included in the analysis are (a) incremental increased livestock production and price premiums from quality improvement, and treated manure to be sold as organic fertilizer (by-product) to replace chemical fertilizer; and (b) benefits from GHG emission reductions from both production and manure treatment. The following assumptions have been applied for the analysis: (a) carbon shadow prices are set following the World Bank "Guidance note on the shadow price of carbon in the economic analysis" (November 2017) ; (b) program life of 20 years; (c) the discount rate adopted by the analysis is 6 percent, chosen according to guidelines from the NDRC, which is in line with the World Bank's guidance for discount rate; and (d) taxes, duties, and subsidies are not included as they represent transfer payments instead of real costs or benefits to society as a whole.

5. **The results of the economic analysis:** Cash flows of benefits and costs for RA1 are projected over a 20-year period to estimate their economic rate of return (ERR). The ERR with GHG reductions is estimated at 20 percent (with low carbon shadow price); 27 percent (with high carbon shadow price); and 13 percent without GHG reduction. All three EERs are well above the discount rate of 6 percent, indicating that RA1 is economically viable and robust.

6. **Financial analysis for low emission livestock production.** Representative livestock production models have been

developed, based on recommended technical packages and prevailing scales of operation. The profitability estimates are averages, based on three different technology and practice packages. The packages include the following technologies and practices in different combinations: improved forage, feed substitutes, feed supplements, precision feeding, methane inhibitors, and manure collection and storage. The financial benefits are analyzed based on the incremental benefits and costs of the program interventions. Assumptions of the financial analysis are the same as for the economic analysis except that the GHG reduction benefits are excluded as they cannot be internalized by farmers. Major livestock production models are selected for the financial analysis (dairy cattle 300 heads; beef cattle 500 heads and sheep 200 heads). The results show that the identified production models are financially profitable (Table 2.3). Currently there are no government subsidies for low emission livestock production at farm level, thus the profitability was calculated without an incentive, then with an incentive, since a well targeted incentive would accelerate the adoption of good production models. Once the practices are well accepted, there would be no need for recurrent subsidies or one-off incentives as production models show profitability also without an incentive.

7. No sensitivity analysis was required under the economic and financial analysis, because: (a) conservative values of outputs and income are already used throughout the program's life; and (b) significant unquantifiable positive externalities (e.g., water, soil quality, and biodiversity improvement) are not included in the financial analysis.

8. **Under the RA2 (Improved Governance System for Sustainable and Low Emission Livestock Sector Management),** enabling environment for implementing the Program would be created, and the impact of activities under RA1 would be enhanced. These would help scale up green livestock development and improve agricultural public services in the province beyond the immediate Program geographical boundaries. The benefits are therefore counted in the economic analysis for RA1, and hence no separate analysis is needed.

9. The one-time 5 percent incentive (similar to a matching grant common under the Bank funded projects) for piloting new low emission technologies and practices is only envisaged under DLI#2 (adoption of low emission technologies). There will be no recurrent subsidies or one-time incentives for activities under other DLIs. The size of the incentive is expected to be around US$1,500 - $5,000 per livestock production entity, based on the investment size, accounting for about 5 percent of the total investment. The average investment undertaken by these entities is estimated at around US$20,000 – 30,000 per enterprise, and in some cases the investment could be up to US$100,000. Livestock entities finance around 95 percent of these investments on average themselves, hence one of the selection criteria is that eligible entities must have financial capacity to carry out such investments.

10. **Contribution to productivity and emission reductions by the technology and practice packages**. Packages of technologies and practices are the focus of the PforR because no single technology would be able to maximize the productivity and emission reduction outcomes. Three combined packages of different levels of technologies and practices were analyzed for productivity and emission reduction potential. Investments in several high-tech low emission livestock production technologies will bring the highest increases of productivity and emission reduction potential. However, TLPEs that will only be able to invest in a limited number of advanced technologies and practices will also achieve improved productivity and profitability and will contribute to greener livestock sector outcomes in Gansu. It should be noted that the NPV from the GHG emission reductions (evaluated in shadow prices) is always higher than the cost of a potential 5 percent incentive (Table 2.3).

11. Table 2.3 below presents the results of the analysis of productivity and emission reduction potential. The data on actual results will be assessed during the PforR implementation under DLI 6. Each indicative technology and practice package includes 3 low emission technologies and practices and 1 monitoring and measuring of the GHG emission reductions by the TLPEs. The specific set of low emission technologies and practices for each TLPE will be determined at

the outset of the PforR, based on local conditions, TLPE needs, and capacities, including their knowledge of existing technologies and practices.

12. A detailed Low Emission Technology and Practice in Livestock Sector Manual (a PAP action) will be prepared before the PforR effectiveness. The manual includes the detailed costing and resource requirements for the new technologies and practices, as well as their contribution to productivity improvements and GHG emission reductions. This will serve as the basis for the design of the context-specific packages of the technologies/ practices tailored for the TLPEs, to ensure profitability of these technologies to the TLPEs and maximize the GHG emission reductions.

**Table 2.3: Results of the analysis of productivity, profitability and emission reduction potential**

| Low emission technology and practice package* | Technologies deployed | Estimated average investment, US$ equiv. | Estimated average incentive, US$ equiv. | Estimated average productivity increase, % | Estimated average profitability increase, % | Estimated emission reductions, % | NPV* of traded ERs |
|---|---|---|---|---|---|---|---|
| Precision feeding, methane inhibitors, manure collection and storage. | Novel high-tech technologies, some not used in China before (methane inhibitors, precision feeding); Existing improved manure management technologies known in China | 50,000 | 2,500 | Up to 25 percent compared to baseline | Up to 30 percent compared to baseline, on account of higher output, higher value products and reduced production costs | Up to 45 percent compared to baseline | 200 sheep model: US$5,550;<br><br>300 dairy cow model: US$50,680;<br><br>500 beef cattle model: US$126,686. |
| Improved forage, feed supplements, methane inhibitors | Novel and existing methane inhibitors | 15,000 | 1,500 | Up to 15 percent compared to baseline | Up to 15 percent compared to baseline, on account of higher output and higher value product | Up to 35 percent | 200 sheep model: US$4,317;<br><br>300 dairy cow model: US$39,418;<br><br>500 beef cattle model: US$98,545. |
| Improved forage, feed substitutes, manure collection and storage | Existing forage and manure management technologies | 10,000 | 1,500 | Up to 5 -10 percent compared to baseline | Up to 5 -10 percent compared to baseline, on account of higher output and higher value product | Up to 25 percent compared to baseline | 200 sheep model: US$3,083;<br><br>300 dairy cow model: US$28,155; |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | | 500 beef cattle model: US$70,389. |

* NPV was calculated with the following assumptions: (i) 6% discount rate; (ii) 20 year time period; (iii) shadow price of carbon of US$43 per ton of CO2 reduction (low price; for reference, the high shadow price is US$86/ton of CO2 reductions).

13. The low emission technologies and practices promoted under the PforR are expected to contribute to the productivity and profitability improvement and GHG emission reductions, as follows:

**Table 2.4: Contribution of T&Ps to the productivity improvement and GHG emission reductions**

| Technologies and Practices | Contribution to Productivity and emission reduction | Contribution to Productivity | Contribution to emission reduction |
|---|---|---|---|
| **Feed and Nutrition** | | | |
| 1. Improving forage quality | ✓ | ✓ | ✓ |
| 2. Feed substitutes | ✓ | ✓ | ✓ |
| 3. Feed supplements | | | ✓ |
| 4. Precision feeding | ✓ | ✓ | ✓ |
| **Animal genetics and breeding** | | | |
| 5. Breeding efficient & robust animals | ✓ | ✓ | ✓ |
| 6. Breeding high performing animals on low-quality feed | ✓ | ✓ | ✓ |
| 7. Breeding low methane producing ruminants | | | ✓ |
| **Rumen modification** | | | |
| 8. Manipulating feeding traits for GHG emissions | | | ✓ |
| 9. Methane Inhibitors | | | ✓ |
| 10. Vaccines to reduce methane production in the rumen | ✓ | ✓ | ✓ |
| 11. Transferring the microbiome of low-methane producing ruminants | | | ✓ |
| **Animal health** | | | |
| 12. Increasing productive lifetime of animals | ✓ | ✓ | ✓ |
| 13. Vaccination | ✓ | ✓ | ✓ |
| **Manure management** | | | |
| 14. Manure collection and storage | | | ✓ |
| 15. Temperature control & aeration of manure | | | ✓ |
| 16. Storage cover | | | ✓ |
| 17. Capturing biogas | ✓ | ✓ | ✓ |
| **Resource efficiency in value chain processing** | | | |
| 18. Low-emissions farm systems | ✓ | ✓ | ✓ |

| | | | |
|---|---|---|---|
| 19. Maintaining inventory of GHG emission in livestock value chain | | | ✓ |

14. **Paris Alignment (PA).** The operation is aligned with the goals of the Paris Agreement on both mitigation and adaptation, and resilience.

15. **Assessment and reduction of mitigation risks.** The PforR finances results related to livestock activities that have varying GHG emission intensities. The activities supported by the Program fall into three categories: sustainable and climate-smart fodder production (DLI#1), low-emission livestock production (DLIs#2, #3, #4, and #7), and emission-reducing and climate resilience-improving livestock production system establishment (DLIs#5 and #6). The interventions for DLI#1 will not expand or promote expansion into areas of high carbon stocks or high biodiversity areas, lead to significant conversion of natural habitat, or involve land use change that is likely to reduce carbon stocks. Instead, these activities are on the list of Universally Aligned (UA) as they contribute to at least two pillars of climate-smart agriculture in terms of enhancing resilience to climate change, increasing agricultural productivity and reducing GHG emissions, and therefore are considered aligned without further assessment. For the low-emission livestock sector development, the Program will adopt the approach of *with project* versus *without project* to lower the emission of livestock farms in the Program counties, compared with BAU. The Program will promote livestock development by adopting low-emission technologies and practices in breeding, herd management, feeding, and manure management (DLI#2, #3, #4, and #7). For example, it will increase livestock productivity and efficiency, reduce methane emissions from enteric fermentation and manure management, and improve animal health to enhance resilience to climate change. The Program will also contribute to closing the institutional gaps in terms of lower-emission development pathways by establishing an incentive system (DLI#6) and developing MRV (DLI#5). The interventions have no carbon lock-in risk. The activities under the PforR are on the UA list and meet the necessary conditions; therefore, they are considered aligned on mitigation, and no further assessment is needed.

16. **Assessment and reduction of adaptation risks.** Climate risks and disasters were identified through the rapid climate risk and disaster screening, which assessed these risks as Moderate. There are both chronic (for example, increasing temperature and changing patterns) risks and acute (for example, extreme heat, droughts, and flooding) hazards. For example, drought is the most serious and obvious climate hazard, which happens with increased frequency and severity as a result of climate change, with severe impacts on sustainable fodder production. Livestock development and animal health are vulnerable to increasing temperatures. The Program contributes to enhancing overall climate resilience, through sustainable, climate-smart practices in fodder production, and improvement of animal health. An incentive system will also be established for promoting low-emission and climate resilience activities and policies related to climate and disaster risk management. In addition, China has established a comprehensive mechanism and capable institutions, including for managing risks from climate hazards. The assessment determined that Gansu has adequate capacity to manage risks from the identified climate hazards. Thus, risks from climate hazards are considered as acceptable and the Program is aligned on resilience and adaptation.

17. **On mitigation**, the PforR Program has a low risk of preventing the country's transition to low-carbon development pathways, given its contribution to decarbonization of livestock development using low-emission technologies and practices and climate-smart agriculture approach in fodder production. The technical design incorporates the necessary measures to lower emissions and establish an effective mechanism for scale-up. **On adaptation**, the PforR Program adequately reduces the physical climate risks and hazards to the investment outcomes. The design consideration in favor of climate resilience and adaptation limits the Program exposure to a low level of residual risk.

18. **CCB.** The Program is expected to generate CCB from both mitigation and adaptation either directly or indirectly. From the mitigation side, the Program will support the achievement of results in decarbonization of livestock development by promoting adoption of low-emission technologies and practices in livestock farms, leading to methane and nitrogen emission reduction. From the adaptation side, the Program will strengthen climate resilience through improved soil health, water conservation ability, improved animal health, breeding, and so on. In addition, the enabling environment (for example, MRV and incentivizing system) for low-emission development pathways is expected to promote replication of these practices in other counties of Gansu province and other provinces, generating broader and long-term effects of CCB. Please refer to the Technical Assessment for detailed justification.

19. **Net GHGs Emission.** The accounting of the GHGs emission reduction under the PforR program is built on the scenario of "*with vs. without*" project. The calculation is on the basis of the DLIs across Results area 1 & 2. The net GHG emissions are accounted based on the data of the 700 demonstration farms, which covers dairy cattle (animal head: 19,000), beef cattle (animal head: 71,400), sheep (animal head: 173,300), and goat (animal head 6,000), with an expectation of 4 percent annual increase of livestock numbers under business as usual (BAU) scenario, and 3.5 percent annual increase for "with project intervention scenario" on annual basis. The GHGs emission value under BAU scenario was generated from GLEAM-i. With traditional low-emission technologies and practices (feeding and manure management), it could reduce 15 percent of methane emission from enteric fermentation, and 10 percent of $CH_4$ and $N_2O$ from manure management at completion stage. The inhibitor/additives will further reduce 20 percent of methane emission from enteric fermentation. It is projected to reduce 67,858 tons of $CO_2$ equivalent annually at the mid-term of project implementation period, and 78,310 tons annually at the completion stage.

**Results**

**Table 2.5. GHGs Emission Reduction from Livestock**

| RAs | DLIs | Project Interventions | GHGs Emission Annual Reduction at MTR ($tCO_2e$) | GHGs Emission Annual Reduction by Program-End ($tCO_2e$) |
|---|---|---|---|---|
| RA1: Low Emission Livestock Development | DLI#2, #3, and #4 | Livestock development with low-emission technologies and practices adopted | 67,858 | 78,310 |

## ANNEX 3. (SUMMARY) FIDUCIARY SYSTEMS ASSESSMENT

1. **Key conclusions and recommendations of the FSA.** A comprehensive Public Financial Management framework has been established to ensure that the Program funds are used for the intended purposes. However, the World Bank's involvement could further strengthen the institutional capacity of such government entities.

2. **The overall fiduciary risk of the Program is rated as Moderate**, considering the identified FM and procurement risks and the proposed mitigation measures, as per below Table:

| Risks | Agreed Mitigation Actions | Timing | Type of action (PAP, DLI, etc.) |
|---|---|---|---|
| The contracts may be awarded to firms or individuals which are debarred or under temporary suspension by the Bank or other multilateral development banks. | - PPMO shall, upon project loan effectiveness, issue an official letter to implementation agencies to ensure that no contract will be awarded to ineligible firms or individuals.<br>- Procurement staff of each IA will be required to check the latest lists of the debarred and temporarily suspended firms and individuals each time before contract award.<br>- The TOR for annual external audit shall include the task of verifying whether such screening mechanism works. | Implementation | Program Implementation Plan (PIP) |
| Lack procurement related information and data available during program implementation | In the semi-annual Program progress report, the agreed procurement KPIs should be reported, to enable monitoring whether procurement continues to perform as assessed. | Implementation | PAP |
| The final payment of works contract may not consistently be made in a timely manner | The PIP shall require the counties to complete the final account audit within six months from the completion of the contract. | Implementation | PIP |
| The Bank may not be informed of any credible and material allegations of fraud and corruption during the implementation. | The Program manual will require the client to regularly inform the Bank of any credible and material allegations of fraud and corruption in the semi-annual Program progress report, as required in the loan agreement. | Implementation | PIP |
| Budget quota of upper-level transfer funds was distributed to the county/district in the second half year of current year which prevents the county/district government from including the entire program funds in its annual budget. | Provincial entities should revisit their budget quota distribution and take actions to ensure the budget quota could be distributed to the county/district in advance. County/district government to include all Program funds in its approved annual budget and one way to do this is to establish multi-year program budgeting to ensure program financing sources are reliable and predictable. | Implementation | PIP |
| 'Program' is not a budget classification element in China and the required Program financial reporting can't be generated from government treasury system. | Select the budget lines associated with program expenditures and report on them. In addition, as an alternative measures, a budget tagging mechanism which can trace program expenditures from government existing integrated financial management system has been recommended and it is expected to be piloted during project implementation. This also creates fundamental basis for generating program financial reporting from government treasury system | Implementation | PIP |
| The internal audit function should be strengthened in some line bureaus in some counties; there is a conflict of interest in some places as the internal audit is conducted by part time staff. | It is recommended that the full-time internal auditors should be recruited, or the function is outsourced to an accounting firm. In addition, all government entities in the Program Counties involved in the Program should submit their annual internal audit work plan and report the implementation of annual plan to the corresponding audit offices. | Implementation | PIP |
| Government auditors did not audit the program funds and prepared the program audit report. | The Bank will work with the Provincial Audit Offices (PAO) to develop the terms of reference (TOR) for program auditing to ensure program funds shall be audited in line with the Bank's policy. Trainings will be provided to strengthen the capacity of external auditors on program auditing. | Implementation | PIP |

## ANNEX 4. SUMMARY ENVIRONMENTAL AND SOCIAL SYSTEMS ASSESSMENT

1. The Program aims to improve productivity and reduce emissions in the livestock sector. There are three broad types of included activities: a) promotion of extension technologies and practices, b) institutional enhancement activities such as developing and using an MRV system for emission reduction in the livestock value chains; and c) physical activities including: supporting sustainable fodder production; and the collection, treatment, and recycling of livestock manure. An ESSA has been conducted to evaluate the soundness of applicable environmental and social (E&S) systems. High risk activities are excluded from the operation and have therefore not been addressed by the ESSA. On this basis, the operation will not have any major negative E&S impacts. However, it is possible that some short-term, site-specific, small-scale, and mitigatable adverse impacts may occur during implementation. The ESSA was consulted with various stakeholders and locally disclosed and released on the World Bank's website.

2. A combination of approaches, including desk review, site visits, and stakeholder engagement, were applied during the ESSA, and relevant stakeholders were consulted. A sample survey of 43 of the 700 TLPEs was conducted in all seven Program counties to collect targeted information on key operational characteristics and socioeconomic profile of these entities to: (i) create a profile and verify the key characteristics of the Program beneficiaries; (ii) carry out analysis regarding the social risks related to vulnerable groups including ethnic minorities relevant to the proposed livestock operation, and (iii) explore how the Program would affect and engage with different stakeholder groups and assess the ability of the government to engage with the target beneficiaries.

3. **E&S Risk Screening and Rating.** E&S screening has been conducted to exclude the activities with high E&S risks. Identified typical E&S risks under the Program include temporary and site-specific risks and potential impacts of dust, noise, wastes, vegetation and habitats disturbance, soil erosion, land use, labor and OHS issues during construction, discharge and emission of various wastes, endanger farmland & grassland ecology and biodiversity, spread pathogenic microorganisms, animal disease & zoonotic diseases, community and public health and safety risks and potential impact during the operation of the constructed facilities and application of technologies promoted, potential for uneven flow of benefits to different types of livestock owners and some downstream E&S impacts induced by non-physical activities. Compared to enterprises, cooperatives and family farms may face more challenges and vulnerabilities in livestock farming development. There is a potential risk that social benefits and beneficiary composition (gender, ethnic minority etc) do not improve over time. To ensure that all target farms, regardless of farm size and structure, gender and ethnicity, benefit equally from the Program, the PforR will establish a monitoring system to track benefits across the Program and to take corrective action if required. The likely impacts of the proposed activities present mostly moderate risks. It is also noted that the boundaries of the Program are known and comprise physical and expenditure areas which can be identified and closely monitored. Notwithstanding this, because the Program demonstration counties include livestock entities in areas with ethnic minority communities, the overall E&S risk rating of the operation is Substantial.

4. The ESSA recommends Program Action Plan actions to enable ongoing monitoring of beneficiaries which will also allow ongoing assessment of the nature and the scale of any social or other risks related to the Program implementation that may arise and how (and whether) they are affecting the program and/or affecting the associated risks. At the same time, neither the Bank OP/BP 7.50 (International Waterways) nor OP/BP 7.60 (Disputed Areas) applies to the Program.

5. **E&S System Assessment.** China has established comprehensive systems and capable institutions for managing the related E&S issues at the provincial and local levels. The ESSA found that the existing E&S systems are effective for managing the assessed E&S risks. **H**owever, it also identified opportunities for systems strengthening via Program Action Plans (PAPs) to improve the development outcomes and to further mitigate impacts. Effective E&S management systems

have been established in China as well as Gansu Province to identify, assess, avoid, mitigate, manage, and monitor the E&S impacts and risks related to the PforR activities, including: (1) regulatory systems, such as applicable laws, regulations, policies, standards, and technical guidelines at the national, provincial and local levels; (2) implementation mechanisms, including administrative procedures, institutional arrangements, and responsibilities for E&S impacts and risk management, and necessary staff and financial resources; and (3) satisfactory outcome performance monitoring of the E&S systems. Gansu has well established environmental risk management systems related to legal frameworks, program management mechanisms, and institutional arrangements. Similarly, there are adequate laws and policies at the national and provincial levels, and Gansu has established appropriate management agencies and mechanisms to govern social risks in relation to the Program activities. The ESSA showed that Program counties have the capacity in terms of qualified staff and skills to implement E&S risk management measures. Based on the assessment, the E&S systems related to the PforR are generally consistent with the requirements of the Bank's PforR policy and guidance. Notwithstanding the general adequacy of the systems to manage the likely risks, and that the legal framework provides a sound basis for addressing the E&S issues related to the Program activities, some gaps and opportunities to improve systems as well as to manage risks in the Program have been identified in the ESSA.

6. **Environmental Management Systems (EMS).** The EMS system assessment focused on EIA and follow-up management systems, Pollution control systems, Eco-environmental Conservation Management Systems, and Health and Safety Management system. In general, these EMSs are consistent with the Bank's PforR ESSA Guidance, the core principles, and the EHS guidelines (including the general guidelines and guidelines for Mammalian Livestock Production, meet processing, annual/perennial crops production) and OIE's Manual of Diagnostic Tests and Vaccines for Terrestrial Animals. They are qualified to manage the environmental issues associated with the PforR activities, particularly on livestock production, animal health and disease prevention and control.

7. The relevant governmental authorities (mainly the EEBs, NRBs, FGBs WRBs, and ARABs, EMBs) at provincial, municipal and county levels have clear responsibilities and qualified staff for managing corresponding environmental risks and impacts, which were confirmed to be consistent with principles and elements set out in the World Bank's PforR ESSA guidance.

8. China and Gansu Province have established mechanisms of EIA and follow-up, water and soil conservation, ecological protection redlines, compulsory immunization system, etc. for managing fodder production, agricultural and animal husbandry, and abating farming point and NPS pollutions. Various measures are taken to manage environmental risks. For example: (1) Early screening is practiced when selecting areas for constructing facilities related to livestock production to avoid, minimize, or mitigate adverse impacts on natural habitats resulting from the Program; (2) preparation of the EIAs and carrying out follow-up monitoring for facilities to be constructed under the PforR are by regulatory of environmental enforcement team of EEBs through the implementation of pollution discharge permitting system; (3) Most of livestock manure is sanitarily treated and applied to cropland, including forage cultivation land and crop straws are used as animal feeds to promote circular economy among crops and livestock production; and (4) Reduced use of chemical fertilizer, pesticides, veterinary drugs are advocated to reduce agricultural NPS pollution and ensure food quality and safety.

9. **Social Management Systems.** The assessment of social aspects under the ESSA concluded that China has formulated a series of laws and policies at the national and provincial levels and has established appropriate management agencies and mechanisms to govern social risks in relation to the Program activities. The ESSA's assessment of social risk management systems focused on the social impacts, risk assessment and management system, cultural heritage protection, occupational health and community safety, land acquisition and resettlement, public

participation and vulnerable groups including ethnic minorities. The systems for social risk management are deemed comprehensive with adequate capacity for implementation.

10. Gansu has established agencies with clear responsibilities and qualified staff for managing corresponding social risks and impacts at the provincial, municipal, and county levels. Under the ESSA's assessment of social risk management systems, the Bank team reviewed the organizational setup of the relevant agencies against the principles set out in the World Bank PforR guidance. For example, China has established a functioning mechanism of Social Stability Risk Assessment (SSRA). Gansu also follows this national requirement and has established agencies with clear responsibilities and qualified staff for managing corresponding social risks and impacts at the provincial, municipal, and county levels, as required by SSRA. SSRA is used by project implementation agencies and managed through the committees of provincial and county political and legislative affairs as a means to engage with communities and to understand social risks and potential mitigation approaches. For projects without mandatory SSRA requirements, social risks assessment and management is normally undertaken through other documents like project feasibility studies or project design reports. The labor authorities have established a tripartite mechanism on labor relations with trade unions and enterprises to solve possible labor issues. The cultural departments are responsible for managing adverse impacts on physical cultural heritage. The natural resource bureaus enforce land acquisition, compensation, and resettlement with support from and coordination with township governments and village committees. The ethnic and religious affairs bureaus prepare the related development plans as required by the jurisdictional governments, protecting the lawful rights and interests of ethnic minority residents. Other line bureaus, such as human resources and social security bureaus and women's federations, are also involved in livelihood restoration for project-affected persons, child labor supervision and SEA/SH. China has also established various authorities to manage and support vulnerable groups, including ethnic minorities. For example, county-level rural revitalization bureaus are responsible for poverty reduction and support to the low-income groups, the federation of people with disabilities for assistance to disabled people, civil affairs bureaus for support to left-behind older people and children, and women's federations for assistance to women.

11. Following the due diligence which included consultations with various stakeholders at both the provincial and county levels, it was ascertained that new livestock farming technologies and practices under the government program are provided to farmers on a voluntary basis. Farmers adopt technologies and practices based on their actual needs and context, and this voluntary uptake approach will continue under the PforR.

12. **The ESSA found that the existing E&S systems are effective for managing the assessed E&S risks**. However, it also identified opportunities for systems strengthening via Program Action Plans (PAPs) to improve the development outcomes and to further mitigate impacts. Effective E&S management systems have been established in China as well as in Gansu Province to identify, assess, avoid, mitigate, manage, and monitor the E&S impacts and risks related to the PforR activities, including: (1) regulatory system with applicable laws, regulations, policies, standards, and technical guidelines at the state and local levels; (2) implementation mechanisms including clear administrative procedures, institutional arrangements, and responsibilities for E&S impacts and risk management, necessary staff and financial resources; and (3) satisfactory performance of the E&S systems. Based on the assessment, the E&S systems related to the PforR are generally consistent with the requirements of the Bank's PforR policy and guidance. Notwithstanding the general adequacy of the systems to manage the likely risks, and that the legal framework provides a sound basis for addressing the E&S issues related to the Program activities, some gaps and opportunities to improve systems as well as to manage risks in the Program have been identified in the ESSA.

13. **Areas for improvement.** The environment and sanitary conditions of some livestock farming zones may be inadequate due to poor manure treatment and utilization and animal diseases control facilities, and some facility operators exhibit a lower adoption rate of health and safety, environmental protection management measures due to

inadequate operational procedures and internal management systems. Further, they may be supervised and inspected inadequately by health authorities. There is a need to upgrade pollution control and animal and zoonotic diseases control facilities, improve their internal management systems and further strengthen the health and safety (including animal welfare) awareness-raising and environmental protection training as well as the daily supervision.

14. Although existing information disclosure channels and GRMs are functional, there is scope for improving and diversifying information delivery channels to farmers, such as written manuals, electronic information through online platforms, specific promotion and awareness raising to different target groups like women, ethnic minorities, older people, etc. Further, there is a need for the identification and management of E&S risks and impacts as well as public consultation and information disclosure in relation to construction and operation of some facilities that were not adequately reflected in project documents. In addition, there is a need to strengthen the GRM to manage potential risk of uneven benefit distribution and E&S risks management.

15. **Actions agreed to be implemented.** Several gaps are identified and actions are agreed such as the following: i) Document cases of good practices and experiences of various counties in controlling pollution from livestock production and in preventing and controlling animal diseases and zoonotic diseases and animal welfare, share with participating operators of small-medium cooperative and large family farm livestock farming zones for them to prepare Environmental & Safety Code of Procedures (ESCOP); ii) Strengthen the publicity, education, supervision and management of the prevention and control of animal diseases, zoonotic diseases, health and safety, animal welfare and environmental protection training and management of the operators of cooperatives and large family farms; iii) Strengthen engagement and grievance management system for beneficiaries and workers with focus on ethnic minority people and women and E&S risks management; iv) Develop Social Benefit Monitoring system to monitor beneficiary composition and distribution of benefits.

16. **GRMs under the PforR.** Communities and individuals who believe that they are adversely affected can raise their complaints through the existing local GRMs, including village (community) level GRM and enterprise GRM. The villager (community) -level GRM consists of three levels. Firstly, grievances are reported directly to the relevant PIUs to seek a solution. Second, grievances are reported to the village or community committee and resolved by grass-root government, which usually take two weeks. Thirdly, grievances are reported to the county PCPBs or the county head's hotline or mailbox, etc., which includes a mechanism of collection, initiation within 7 days, and solving within two months. An enterprise GRM has two aspects. First is workers' grievances, which are handled through a three-tier labor dispute resolution mechanism, namely, the enterprise labor disputes and redressing mechanism, the township government's labor disputes mediation center and the county government's labor disputes mediation center. On the enterprise level, workers can seek a solution through the enterprise/factory manager mailbox, or the trade union. If dispute cannot be addressed satisfactorily, the worker can go through the government mediation mechanism, or seek solution by labor arbitration. Second, the enterprise sets up an external relations department, and assigns a contact and a telephone number to collect complaints and suggestions from the public. Any persons and entities can raise their suggestions, opinions or complaints through ways like website, letters, telephone call, fax, visits, etc. The key operating principles of the GRMs mentioned above include: i) GRM should be disclosed to the public by all means, including address, contact information, persons in charge, time and location for visits, ways to check progress and results of resolution, etc; ii) GRM is open to all people for free; iii) people or entities can raise their complaints in real name or anonymously (it shall not disclose or transfer the petitioner's report information to the person or organization being denounced or reported); and iv) the complaints have to be resolved in a legal, fair and timely manner. Communities and individuals can also resolve disputes or complaints through civil actions at court.

17. **Stakeholder Engagement** was carried out with over 380 relevant stakeholders during the ESSA process, of which over 30 percent were female. The draft ESSA underwent consultation in December 2023. In October 2023 and February 2024, visits were undertaken to eight ethnic minorities-concentrated villages in Guazhou County and Sunan Yugur Autonomous County of Gansu Province and discussions held with village leaders and representatives. In March 2024, supplementary site visits were conducted to seven Program counties (districts) for the socio-economic survey of a sample of 43 TLPEs, including enterprises, cooperatives, family farms and household farms. These visits and consultation helped understand the potential impact and benefits of the Program on the potential beneficiaries, their basic social, economic and cultural circumstances. They also provided an opportunity to conduct an assessment of PforR-related actions related to information disclosure, public participation, grievance redress mechanism, etc. The consultation indicated that the PforR will not pose negative impacts either on vulnerable groups in ethnic minority-concentrated villages or the TLPEs and has wide support among the TLPEs that expect to benefit from the proposed activities. The feedback received was addressed in the updated ESSA. The final ESSA was disclosed on the Bank's website on May 14, 2024.

## ANNEX 5. PROGRAM ACTION PLAN

| Action Description | Source | DLI# | Responsibility | Timing | | Completion Measurement |
|---|---|---|---|---|---|---|
| E&S: Prepare and implement environmental & safety code of procedures (ESCOP) | Environmental and Social Systems | NA | PPMO, CPMO, relevant local gov authority | Recurrent | Continuous | (i) Cases of good practices and experiences documented; (ii) ESCOP prepared for each LPE; (iii) LPEs equipped with essential animal safety, disease prevention and control facilities, and manure treatment facilities; (iv) report in Progress Report. |
| E&S: Strengthen the publicity, education, and management training of participating livestock production entities | Environmental and Social Systems | NA | P/CPMO, relevant local govt offices | Recurrent | Continuous | (i) Training programs are implemented in each P county (district) at least twice each year; (ii) The PMOs keep detailed records of these events (date, location, contents, participants, photologs, etc) and report in the Progress Reports. |

| | | | | | | |
|---|---|---|---|---|---|---|
| F: Recruit full-time internal auditors, or outsource the function to an accounting firm. | Fiduciary Systems | NA | PPMO | Recurrent | Continuous | Full-time internal auditors recruited, or the function outsourced to an accounting firm. |
| F: Report actual procurement performance data to enable Bank to monitor the procurement performance. | Fiduciary Systems | NA | PPMO | Recurrent | Semi-Annually | Agreed procurement KPIs reported in the semi-annual program progress report. |
| T: Develop a manual of LETP for fodder production and livestock sector | Technical | NA | DARA PPMO with inputs from Bank | Other | Within 3 months of Program effectiveness | Finalized manual, acceptable to the Bank, shared with the Program counties. |
| T: Establish and implement women-to-women mentorship program | Technical | NA | DARA PPMO | Recurrent | Continuous | Mentorship program established and women enrolled as mentors and mentees. |
| T: Prepare the Technical guidelines for low emission livestock product certification. | Technical | NA | PPMO | Due Date | 30-Jun-2026 | Technical Standards prepared and approved for use. |
| T: Technical guidelines for LETP in livestock sector adopted for | Technical | NA | PPMO | Due Date | 31-Dec-2026 | Technical guidelines for (i) sustainable fodder production and |

| | | | | | | |
|---|---|---|---|---|---|---|
| use at the provincial level | | | | | | (ii) LETPs in the livestock sector adopted for use at the provincial level. |
| T: Training materials developed on LETP for fodder production and livestock sector | Technical | NA | PPMO | Recurrent | Continuous | The material shared with the Bank |
| E&S: Strengthen engagement and grievance management system for beneficiaries and workers with focus on ethnic minority people and women and E&S risks management. | Environmental and Social Systems | NA | P/CPMOs, relevant local govt authorities | Other | (i) established within 6 months of the Program effectiveness; (ii) reported every six moths throughout the Program implementation. | (i) Improved engagement and GRM system in place for ongoing feedback and resolving grievances in a timely way; (ii) Stakeholder engagement, E&S risk mgnt process for each physical activity and grievances received are recorded and reported in the PR. |
| E&S: Develop Social Benefit Monitoring system to monitor beneficiary composition and distribution of benefits | Environmental and Social Systems | NA | P/CPMO, relevant local govt authorities | Other | (i) and (ii) established within 6 months of the Program effectiveness; (iii) reported every six moths throughout the Program implementation. | (i) A baseline database established, disaggregated by ethnicity, language, gender and age; (ii) Monitoring system established for |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | ongoing measurement of benefits across the Program; (iii) Periodic monitoring carried out and reported in the PR. |

## ANNEX 6. IMPLEMENTATION SUPPORT PLAN

1. **The strategy and approach for implementation support includes an emphasis on the technical, E&S and fiduciary support needed during implementation.** The World Bank team including staff from across the global practices has provided extensive technical expertise during preparation. The Bank team will continue to provide technical support during implementation to ensure that the agreed improvement in practices and protocols will be implemented accordingly. The implementation support from procurement and the financial management team will focus on reviewing and monitoring the compliance with the government own systems, the conditions defined in the legal agreements, and the actions defined in the PAP. The implementation support will also assist to address the few shortcomings identified in the fiduciary assessment.

2. **To address risks identified by the risk assessment, a multi-layered approach to the PforR supervision has been designed.** On the technical aspects, the Bank team will ensure to provide the necessary technical assistance to improve the quality of Program implementation. Emphasis is placed on (a) supporting early-stage implementation and building institutional capacity; (b) reviewing implementation progress (including that of the PAP) and achievement of Program results and DLIs; (c) providing support to resolve emerging implementation issues; (d) monitoring the adequacy of systems performance, and compliance with Legal Agreements; (e) supporting the Government in monitoring changes in risks; and (f) providing ongoing technical support. On the E&S side, management of social risks will be strengthened during the implementation support of the PforR. To appropriately manage the potential social and other risks, including: (i) geographical targeting of supervision activities, with visits to all seven counties at least once annually; (ii) regular random selection of TLPEs for impact and risk assessment by selecting at minimum 5-6 TLPEs to visit in each county every year; (iii) use of additional social risk management capacity for implementation support; (iv) regular socio-economic surveys of the participating livestock production entities; (v) strengthened verification approach to ensure that all TLPEs undergo verification; as well as (iv) inclusion of additional PAP actions: Strengthening “Engagement, Feedback and Grievance Management” and “Social Benefit Monitoring” systems in the government and Bank programs.

**Table 6.1. Main Focus of Implementation Support**

| Time | Focus | Skills Needed | Resources Estimate (Staff Weeks) |
|---|---|---|---|
| First 12 months | • Implementation of the Program management systems<br>• Setting up cross-administrative-level coordination mechanism<br>• PPMO and CPMO staff capacity building, on-the-job training on E&S and fiduciary<br>• Procurement process and training<br>• E&S training, support to implementation of requirements<br>• Social risk and impact assessment and monitoring at least every 6 months<br>• Technical support to activities and implementation (including, the manual for low-emission technologies and practices)<br>• FM and disbursement training and capacity building | • Core team, particularly technical, FM, procurement, and E&S experts<br>• Low-emission value chain development expert | 62 |

| Time | Focus | Skills Needed | Resources Estimate (Staff Weeks) |
|---|---|---|---|
| 12–48 months | • Technical support to livestock product certificates with green, organic or low-emission indications, manure treatment, animal health, and other activities<br>• Review of environmental, social, and financial performance under each RA<br>• Continued improvements in project management systems including fiduciary and E&S systems<br>• Social risk and impact assessment and monitoring at least every 6 months<br>• Review of results verification and disbursement of funds<br>• Program MTR | • Core team, particularly technical, FM, procurement, and E&S experts<br>• Livestock product certification expert and animal health expert | 62 |
| 48–60 months | • Completion of activities<br>• Review of results verification and disbursement of funds<br>• Capacity building and facilitation of knowledge exchange and events<br>• Social risk and impact assessment and monitoring at least every 6 months<br>• Support for technical and financial analysis of Program investments<br>• End term evaluation and client ICR | • Core team, particularly technical, FM, procurement, and E&S experts<br>• Low-emission value chain development expert | 56 |

**Table 6.2. Task Team Skills Mix Requirements for Implementation Support**

| Skills Needed | Number of Staff Weeks (Annually) | Number of Trips | Comments |
|---|---|---|---|
| Task team leader/overall program management | 10 | Four in the first year, two thereafter | Country office-based staff |
| Co-task team leader/program management | 10 | Four in the first year, two thereafter | Country office-based staff |
| Procurement specialist | 3 | Two per year | Country office-based staff |
| Financial management specialist | 3 | Two per year | Country office-based staff |
| Operations specialist | 5 | Two per year | Country office-based staff |
| Environmental specialist | 3 | Two per year | Country office-based staff |
| Social development specialist | 6 | Two to three per year | Country office-based staff |
| Social development specialist | 4 | Two to three per year | International staff |
| M&E specialist | 4 | Two per year | Country office-based staff |
| Animal health expert | 2 | Two per year | Consultant (national) |
| Low-emission livestock value chain development expert | 4 | Two per year | Consultant (international) |
| Green feed production expert | 4 | Two per year | Consultant (national) |
| Livestock product certification expert | 4 | Two per year | Consultant (national) |

## ANNEX 7. AGREED LIST OF ELIGIBLE TECHNOLOGIES AND PRACTICES

### Part A. List of Climate Smart Fodder Production Management Technologies and Practices (CSFPMTP)

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| **1. Using legumes:** Increasing use of legumes to improve the diet digestibility and animal intake, supress CH4 emissions, increase nitrogen fixation, improve soil quality and health, and substitute the need for synthetic fertilizer.<br>**2. Crop Rotation:** Implementing a diverse crop rotation can improve soil health, reduce pests and diseases, and increase resilience to climate variability.<br>**3. Climate-resilient fodder species:** Introducing and promoting the cultivation of climate-resilient forage species that are adapted to the local conditions improves forage productivity and quality and ensures a more reliable feed resource for livestock. |
| **4. Water management techniques:** Implementing water conservation measures, such as rainwater harvesting, irrigation efficiency improvements, and water recycling, helps ensure adequate water supply for livestock and vegetation, especially in arid and semi-arid regions.<br>**5. Soil conservation practices:** Applying conservation agriculture techniques, such as minimum tillage or no-tillage, helps reduce soil erosion, improve soil health, and increase carbon sequestration. Additionally, incorporating cover crops and crop rotation enhances soil fertility and reduces weed pressure. Broadcasting seeding increases biomass and root density (i.e., organic matter content) in soils. |
| **6. Manure application:** Maximizing the use of manure substituting chemical fertilizer, where possible. Emissions from manure are greatly reduced by matching the amount of nitrogen applied through manure to the amount needed for optimal fodder growth; ensuring the nitrogen available from manure is considered when applying any additional nitrogen fertilizers; and avoiding manure application on wet soils.<br>**7. Targeted use of fertilizers:** More targeted use of fertilizers based on soil condition and needs enhance forage quality and quantity and reduce environmental effects. |
| **8. Reduction of fodder/feed wastage:** Improving storage facilities and fodder/feed handling can reduce losses and improve the efficiency of |

### Part B. Green and Low Emission Technologies and Practices in Livestock Value Chains (GLETP-LVC)

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| **a) Feed and Nutrition** |
| **1. Improving forage quality:** Using high quality forage and processing it to effectively improve digestibility of the diet, improve animal productivity, and reduce emissions at the same time.<br>**2. Feed substitutes:** Feed substitutes change fermentation processes in the rumen and influence methane production. Feeding corn or legume silages, starch or soya decreases methane production compared to grass silages. Combining maize and legume silage also reduces nitrogen excretion in urine.<br>**3. Feed supplements:** Concentrate feeds and starch generally provide more digestible nutrients. Feeds for effective mitigation practices include lipids (from vegetable oil or animal fat) and concentrate feed supplementation in mixed and intensive systems. By-product feeds with high oil contents, such as distiller grains and meals from the biodiesel industry, are some of the cost-effective lipid sources. In addition, supplements like 3-nitrooxypropanol (3-NOP) or trade name Bovaer fed to livestock result in lower methane emissions.<br>**4. Precision feeding:** Precision feeding is about getting the right nutrient to the right animal at the right time. It increases feed efficiency and productivity and consequently improves farm profitability and reduces emissions. Precision feeding requires advanced technological facilities to precisely monitor the animal's needs and manage pastures and forage production. |
| **b) Animal genetics and breeding** |
| **5. Breeding efficient & robust animals:** Breeding efficient and more robust animals consistently increases their output per unit of input due to being less susceptible to diseases and changes in the environment and management.<br>**6. Breeding high performing animals on low-quality feed:** Most animals perform better on high-quality feed, but current research is identifying traits for selecting animals that show excellent performance on lower quality feed. It is estimated that within five years, monogastric animals will be available for the market that perform excellent on low quality feed. |

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| **7. Breeding low methane producing ruminants:** Selective breeding of animals with low methane emissions per unit of feed consumed results in a permanent methane reduction of about 10%, with no negative impacts on productivity recorded. |
| **c) Rumen modification** |
| **8. Manipulating feeding traits for GHG emissions:** Early life feeding strategies, such as in lambs and calves after weaning, triggers a long-lasting influence on the rumen composition of the microbial ecosystems in the stomach and the anatomy of the stomach towards lower methane production in adult life.<br>**9. Methane Inhibitors**: More than 200,000 plant secondary compounds or phytochemicals have been identified worldwide of which some have anti-methanogenic properties including tannins, essential oils and saponins. Maintaining the right equilibrium between reducing enteric methane production while maintaining or increasing livestock performance.<br>**10. Vaccines to reduce methane production in the rumen:** Vaccines are being tested to modify the rumen microbial ecosystem that would stimulate the host animal to produce antibodies against methanogens. They enhance antigens that stimulate antibody responses to the methanogens present in the rumen and reduce methane from enteric fermentation without reducing productivity.<br>**11. Transferring the microbiome of low-methane producing ruminants:** A possible future intervention is transferring the microbiome of low-methane producing ruminants to the rumen of high-methane producing ruminants. |
| **d) Animal health** |
| **12. Increasing productive lifetime of animals:** Extending the productive lifetime of animals through approaches such as improved conception rates, earlier time of first reproduction and thereby increasing reproductive lifetime, and adjusting overall lifetime decrease the total GHG emissions per total product over the animal's lifecycle.<br>**13. Vaccination:** Increased disease resistance directly improves animal health, increases production efficiency, and reduces GHG em. |
| **e) Manure management** |
| **14. Manure collection and storage:** Collection of manure and sound storage with concrete or hard clay floors prevents run-off of nutrients thereby eutrophication of the environment, allows for recollection of nutrients to apply in the farms substituting chemical fertilizer, improves hygiene of livestock, and reduces GHGs emissions.<br>**15. Temperature control & aeration of manure:** The temperature of manure influences the amount of methane and ammonia produced through anaerobic digestion, with emissions reduced at lower temperatures (but anaerobic digestion stops at very low temperatures). Aeration of solid and liquid manure substantially decreases methane and nitrous oxide emissions.<br>**16. Storage cover:** Manure stored should be supported with good cover (concrete, wood or possibly as simple as banana leaves). Semi-permeable covers decrease ammonia, methane, and odor emissions, but increase nitrous oxide emissions.<br>**17. Capturing biogas**: Anaerobic digestion of manure leads to the production of methane as a by-product, which is a source of renewable energy. Efficient biogas digesters avoid 60-80% of the methane emissions that would occur from manure otherwise. |
| **f) Resource efficiency in value chain processing** |
| **18. Low-emissions farm systems:** Improved resource efficiency (energy, water) reduces emissions through application of green and renewable energy, energy and water saving technologies and using electric equipment/machines along the value chain, such as farming machinery, irrigation equipment, feed mills.<br>**19. Maintaining inventory of GHG emission in livestock value chain:** By tracking emissions, farms identify areas where emissions are high and implement strategies to reduce the emissions. Some of the strategies include more sustainable farming practices, improving feed efficiency, and implementing manure management techniques. |