

**KAZAKHSTAN**

**Sustainable Livestock Development Program (P170365)**

**PROGRAM-FOR-RESULTS**

**TECHNICAL ASSESSMENT**

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## Abbreviations

CERs	Certified Emissions Reductions
CO <sub>2</sub> eq	CO <sub>2</sub> equivalent
COP	costs of production
DLI	disbursement-linked indicator
ETS	Emission Trading Scheme
FAO	Food and Agriculture Organization of the United Nations
GHG	greenhouse gas
GoK	Government of Kazakhstan
GLEAM	Global Livestock Environmental Assessment Model
ICT	information and communication technology
IFC	International Finance Corporation
NDC	Nationally Determined Contribution
IPCC	Intergovernmental Panel on Climate Change
LD	Livestock Department
LFRI	Livestock and Fodder Resource Institute
LSU	livestock units
M&E	monitoring and evaluation
MoA	Ministry of Agriculture
MEGNR	Ministry of Ecology, Geology and Natural Resources
MRV	monitoring, reporting, and verification
Mt	megatonne, equal to 1 billion kilograms (10 <sup>9</sup> kg)
NAPA	National Adaptation Programme of Action
NASEC	National Agrarian-Science and Education Center
NDC	Nationally Determined Contribution
NIR	National Inventory Report
OIE	World Organization for Animal Health
PDO	Program Development Objective
PMO	Program management office
Program	Program-for-Results
PVS	Performance of Veterinary Services
SOC	soil organic carbon
TT	Task Team

# 1 Program Description

1. **The Sustainable Livestock Development PforR Program (hereafter the Program) will help with implementation of the parts of the State Program of Agro-Industrial Complex Development that are supporting improving veterinary service delivery, improving animal recording, scaling up the farmer-centric service delivery model, and improving agri-environmental policies for high-value meat production within the vision and directive of the Government of Kazakhstan (GoK)'s long-term Livestock Strategy.**

2. **The Program will be implemented from 2021 to 2025 and has the development objective of supporting the development of environmentally sustainable, inclusive, and competitive beef production in Kazakhstan. The Program focuses on the high-value beef production in line with the GoK priorities.** The Program will target improved delivery of public goods and services for export-oriented high-value meat-producing individual and household farms. It will also target improved public expenditure management in the livestock sector by improving veterinary service delivery and animal recording, scaling up the farmer-centric service delivery model, and improving agri-environmental policies for the cattle subsector.

3. **The Program will address environmental performance and climate change mitigation in beef production.** Targeted public interventions are needed to translate the high-level declarations and ambitions on Green Growth into practical and adaptable measures for the beef production sector. The Program will address issues on sustainable grassland management (land degradation, biodiversity conservation), pollution control (manure management on feedlots and slaughterhouse waste management), and mitigation of net greenhouse gas emissions (GHG) along the value chain—from feed production to slaughterhouses. The Program will instigate a switch to new and efficient agri-environmental-targeted support, support GHG monitoring, verification and reporting system, and scale-up good animal husbandry and grassland management practices.

4. **The Program strengthens the focus on the farmer-centric approach, which aims at grounding agricultural growth on individual and household farms to foster rural employment by supporting these farmers in improving the conditions to grow their business.<sup>1</sup> The approach** is based on four elements: (1) access to knowledge and cooperation; (2) genetic improvement; (3) resources for business (land, feed, technology); and (4) downstream value chain development (feedlots, slaughterhouses, and traceability system). This is a considerable shift away from the focus of government support for large corporate agribusiness to supporting individual and household farms to achieve growth in the sector, to better link to the value chain, and to create jobs and income opportunities in rural areas. The farmer-centric approach is not a new concept in Kazakhstan. However, past policies have not offered strong mechanisms and direction for its implementation, often remaining more an intention than an action. The government, realizing this, wishes to improve the efficiency and targeting of its support programs. Hence, the Program focuses on improving delivery of the implementation of the farmer-centric approach, improving the efficiency of public support programs to assist business expansion for individual and household farms, and

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<sup>1</sup> *Individual farms* and *household farms* are formal entities and statistical categories in Kazakhstan (see Box 1 in the PAD). In this assessment we also regroup the two categories under the term *individual and household farms*.

improving and augmenting agricultural advisory and animal health services that can reach remote areas and individual and household farms.

5. **The Program will result in accelerated productivity growth and a profound transformation of meat production in Kazakhstan.** It envisions fostering a 47 percent increase in national beef output over the five years of its implementation, achieved through a combination of productivity gains and expansion. Productivity gains will be achieved from improved grassland management (reducing the average land requirement per head from 6.25 hectares to 5.31 hectares) and from improved animal and herd management (quintupling the number of calves fattened on feedlots). This beef output increase is expected to increase the overall cattle herd by only 33 percent over five years, which is considered a sustainable growth given the country's available grassland areas and grain resources. Through the Program, an estimated incremental 200 million tons of beef (carcass weight) will be exported to neighboring markets. (See Box 1 for an overview of the production systems and farm types.)

6. **Three Program Development Objective–level results indicators will measure progress toward the PDO:**

- Share of public expenditure in support of beef cattle production and processing that directly address environmental performance (*sustainable*).
- Number of small and medium farmers selling to feedlots (*inclusive*).
- Value of beef exports (*competitive*).

**Box 1. Beef farming and farm structure in Kazakhstan**

Kazakhstani beef production relies mostly on grazing systems. Currently, these systems are estimated to use about 60 million hectares of grassland (including also for sheep and dairy production) and produce 500,000 tons of carcass weight, mostly sold on the domestic market. Production growth potential is vast, both through expansion (120 to 130 million hectares are estimated to be suitable for grazing) and through productivity gains at animal and grassland level since both are relatively low compared to grazing systems in similar agro-ecological conditions. The value chains are mostly informal, with a limited number of calves sold to feedlots (about 260,000 over a national population of 7.2 million cattle).

*Individual farms*, the core target of the Program, is a farm category that emerged after the transition to the market economy. These farms generally employ workers, use private or leased land, and benefit from various tax privileges. Individual farms vary significantly in size. About 27,000 own beef cattle, with an average herd size of 50 cattle.

*Household farms*, also addressed by the Program, constitute the largest category of farms and are characterized by low productivity level commercial or noncommercial/subsistence farming. Most of the national cattle herd is owned by household farmers: around 2–5 head of local dual-purpose breeds per unit. Household farms typically use public grazing land and purchase grain and hay for winter feeding. Beef is not the primary production among household farms but rather a coproduct of milk production.

The largest farms are normally registered as *agricultural enterprises* and have the legal status of limited liability partnerships or joint stock companies. The number of cattle on these farms decreased tenfold during the 1990s, to about 5 percent of the cattle herd, mostly for dairy production.

7. **Six Disbursement Linked Indicators (DLIs) will measure progress toward achieving the Program key results.**

*DLI 1.* Cattle are being registered in the unified information system for traceability, genetic improvement, and animal health control.

*DLI 2.* Small and Medium Farmers have access to improved and upgraded veterinary services.

*DLI 3.* Small and medium farmers have been trained and certified in Good Practices in the amounts and as set forth in the Disbursement Formula.

*DLI 4.* The number of small and medium farmers participating in the Sybaga Program and selling cattle to feedlots has increased in the amounts and as set forth in the Disbursement Formula.

*DLI 5.* Share of public expenditure in support of green growth and sustainability in the beef sector.

*DLI 6.* The Borrower has made commitments for the control of GHG emissions and adaptation to climate change in the beef sector.

## 2 Description and Assessment of Program Strategic Relevance and Technical Soundness

### 2.1 Strategic Relevance

8. **The Program addresses two strategic development targets for Kazakhstan: economic diversification and income growth in rural areas.** The Program will foster improvements in public service delivery and management of expenditure frameworks, which will mobilize growth potential in the livestock sector to address high-level government priorities. Through shifts in policies and public expenditures, as well as an increase in capacity development, the Program will boost inclusive and environmentally sustainable livestock value chains that can link the vast land and water resources of Kazakhstan to neighboring beef markets.

9. **The meat sector has a large potential for growth and can promote job creation and income opportunities in rural areas if expansion is inclusive.** Large neighboring markets of China (at US\$2.6 billion worth of beef imports, and growing), the Middle East (US\$1.8 billion, growing), and the Russian Federation (US\$1.3 billion, contracting) represent sizeable opportunities for Kazakh beef producers, provided they improve in competitiveness (IFC 2019). On the supply side, grassland resources are currently underutilized, and significant potential exists to expand livestock production through both sustainable intensification and expansion of rangeland utilization (Hankerson et al. 2019). The country also produces grain surpluses that can be used as feed in feeding operations. Furthermore, livestock value chains and meat value chains in particular are labor intensive, which represents a substantial business opportunity for the large number of household farms and individual farms owning cattle that are ready to invest in that activity.

10. **Public investment is needed to facilitate the meat sector's transition toward inclusive and environmentally sustainable export-oriented development.** Public investment is needed to implement the traceability and food safety regulations required to access international markets; to repair and expand equipment and infrastructure to use pastures more efficiently; to level the economic playing field so individual and household farms can participate in the sector's growth; and to formulate and implement the regulatory and incentive systems required to channel growth on an environmentally sustainable path.

### 2.2 Technical Soundness

11. **The Program design is based on recent analyses of the livestock sector in Kazakhstan, detailed assessments of the Livestock Strategy, the State Program of Agro-Industrial Complex Development, and national implementation and monitoring capacities.**

12. **A comprehensive review of existing literature and studies was conducted to inform the preparation of the Program.** The main sources consulted include a recent review of public programs in the agriculture sector, prepared by the Joint Economic Research Program, that identifies the main shortcomings of current programs and proposes specific recommendations for adjustments to the current system of support measures that were taken into consideration in the preparation of the Program (World Bank Group Joint Economic Research Program 2018). Further studies—carried out by the International Finance Corporation (IFC), the World Bank, and Texas A&M University—confirmed the potential for sustainable growth in the livestock sector and the opportunity for Kazakhstani beef to be competitive on

international markets, provided productivity gains and economies of scale are achieved in the primary production sector (Norman E. Borlaug Institute 2019; IFC 2019; World Bank 214a). Other analytical work carried out by Hankerson et al. and the World Bank pointed at the potential to improve pasture productivity (Hankerson et al. 2019; World Bank 2014b). These results all validate the GoK’s strategic focus to develop export-oriented beef value chains and were instrumental in designing the Program. The Program design also drew on a recent study of the adoption of climate technologies in Kazakhstan’s agri-food sector, proposing specific interventions for livestock (FAO/EBRD 2017).

13. **Specific analyses were also carried out to underpin the technical soundness of the Program, as presented in the following sections.** These analyses were performed to assess selected feasibility issues, environmental implications, and capacity development needs related to the State Program of Agro-Industrial Complex Development and the Livestock Strategy. The results from these analyses were used to formulate a technically sound Program. Table 2.1 presents a summary of the technical data and assumptions about the estimated meat sector’s transformation achieved through the Program. These technical parameters (presented in greater detail in Appendix A) were used consistently in the various analyses. Results from the analyses and an explanation of how these were used to inform the Program design are introduced below, along the three results areas of the Program: Results Area 1: Improve veterinary service delivery and animal recording and information system; Results Area 2: Scale up the farmer-centric service delivery model; and Results Area 3: Efficient agri-environmental policies for the livestock sector.

## 2.2.1 Results Area 1: Improve Veterinary Service Delivery and Animal Recording

14. This result area aims at improving the delivery of public services, with a focus on animal health, food safety, and veterinary service delivery, that are necessary conditions for a competitive and export-oriented livestock sector. An integrated animal identification and recording system with full coverage of the herd is essential for enabling the access to high-value export markets and improving the genetic potential of the national herd (DLI 1). Access to quality veterinary services by individual and household farms is a condition for improving animal health and productivity in individual and household farm dominated value chains (DLI 2).

**Table 2.1.** Technical and marketing impacts achieved under the Program

	2019	2025, with Program
<b>Animal numbers</b>		
National herd of cattle - total (head)	7,150,000	9,638,000
National herd of beef cattle (head)	2,341,684	5,451,684
<b>Farm numbers and size</b>		
Individual farms with cattle	27,000	47,000
Individual farms selling calves to feedlots	14,000	34,000
Average herd size on the individual farms (heads)	48	77
<b>Production</b>		
Average live weight at slaughter on feedlots	500	550
Capacity of feedlots (animal places *2 cycles)	450,000	940,000
<b>Marketing</b>		
Total beef produced (tons carcass weight)	477,000	525,000

Total beef sold on export market (tons carcass weight) <sup>a</sup>	30,000	130,000
<b>Production practices</b>		
Individual farms implementing good animal and grassland management practices (number)	1,350	32,400
<b>Land use</b>		
Grassland requirements (ha per head)	8.0	6.2
Area of grassland under improved grazing management (thousand ha)	734	2,737

Source: World Bank.

Note: A *herd of cattle* includes dairy cattle as well as beef cattle.

a. Average export price is estimate at US\$3,000 per ton.

*DLI 1. Cattle are being registered in the unified information system for traceability, genetic improvement, and animal health control.*

15. **To prevent food safety and animal disease transmission issues, importing countries have increasing requirements regarding the traceability of meat and live animals.** Building a traceability system is therefore essential for Kazakhstan to expand its exports. Past efforts have been successful in developing an animal registration system, which is now functional and includes most of the country's cattle. Kazakhstan also invested in developing various other traceability systems—for breeding animals, health tracking, and recording veterinary health activities, such as vaccination. However, the Ministry of Agriculture (MoA) assesses that much of the potential benefit from these systems remain unutilized because of a lack of animal coverage, integration, and analytical capacities.

16. **In this regard, the MoA has developed a vision for a unified animal identification and registration system that tracks animals and their products from farm to fork/export. Its implementation will be supported through the Program.** The vision is ambitious, and the Program will ensure adequate planning, institutional arrangements, and the budgetary allocation necessary to improving the coverage, reliability, and interconnectivity of these systems (Figure 2.1).

**Figure 2.1.** Principle of the unified animal identification and registration system



Source: FAO 2016.

17. **Animal recording systems in support of animal traceability, animal health information, and animal performance recording are currently managed by three separate information systems under separate services of the MoA.** By connecting them, the Program will yield synergies between information systems (e.g., cross-analysis of animal health and animal performance) and decrease management costs. The performance of the individual information systems will also be improved under the Program. First,

the performance recording of breeding animals is currently limited to imported breeds and thus does not allow the identification of potential pedigree animals in the national herd. This limits the effectiveness of breed development efforts and hinders owners of animals belonging to national breeds (e.g., the Kazakh whitehead) in obtaining access to breeding programs. The Program will support raising awareness and data collection to extend coverage and include local breeds. Second, livestock market visits have revealed that a share of the animals are identified only by their breed when they are ready to be sold, and not at birth. The Program will support awareness campaigns and controls to expand the coverage of animal identification.

*DLI 2. Small and Medium Farmers have access to improved and upgraded veterinary services.*

18. **Despite Kazakhstan’s significant achievements in reducing the risk of zoonotic and transboundary diseases, the World Organization for Animal Health (OIE) Performance of Veterinary Services (PVS) evaluation of 2018 reports limited capacity of public veterinarians to address the needs of producers regarding production diseases.** This results in efficiency and financial losses, especially among individual and household farms that do not have on-site animal health practitioners and do not have access to private service providers given their very limited number.

19. **The most direct benefit of controlling production diseases is improving productivity and income.** These veterinary services are to be provided through private or public sector veterinarians on a fee-for-service basis (Umali, Feder, and de Haan 1994). In fact, this is the adopted model of veterinary service delivery in virtually all high-income countries where commercial beef cattle production is an important economic activity. The GoK has declared that it intends to move in this direction and wishes to create the enabling environment and provide required tools, resources, and training to existing public and private sector veterinarians or para-veterinary professionals so that they can gradually expand their services to cover production diseases for individual and household cattle farms. The Program will thus enable private veterinary service development for an improved delivery of animal health services for individual and household farms for the control of production diseases.

20. **Because Kazakhstan does not have extensive experience with private sector-oriented veterinary service delivery, the transition to such a delivery model will require some changes in the regulatory framework.** Although the GoK has been successful in addressing animal health issues that are of public health concern and has improved the overall infectious disease situation in the livestock sector, it has not been able to develop an enabling environment for addressing production diseases, especially for individual and household cattle farms. The Program will support the development of legislation that recognizes and protects private veterinary practice, and that includes provisions for interested veterinarians to deliver official government veterinary interventions as well as on-demand interventions for farmers under contract with the government. The country legislation should specifically establish that veterinarians are allowed to engage in veterinary practice in the private sector. These veterinarians should be registered by the veterinary statutory body, and the law should provide for delegation that allows the government to engage private veterinarians to carry out specific official activities on behalf of government—such as diagnostic testing or vaccination—in regard to national disease control programs and the signing of health certificates.

21. **The Program will also support the training of 5,000 veterinarians in line with OIE standards** (in particular Article 3.4.6, on the regulation of veterinarians and veterinary paraprofessionals). This will create an enabling environment for private veterinary practices and will help strengthen the veterinary statutory body by ensuring a legal basis for its proper establishment and operation, and also by

empowering it to carry out the various regulatory responsibilities identified in Chapter 3.4 of OIE's Terrestrial Animal Health Code. The latter is essential for registering the veterinarians; setting minimum standards for the profession; and guaranteeing continuous education, training, and quality control of veterinarians. In addition, support will be provided to interested private and public veterinarians who would like to qualify for the service provision for individual and household farms. This support will include business skills training, financial incentives to purchase the necessary basic equipment for private practice, and government contracts with private veterinarians to provide government services.

22. **Under the Program, private and public veterinarians—who are licensed and qualified according to standards set by the national veterinary statutory body—will provide a range of services to individual and household farms**, including reproductive management; herd health management that includes vaccination, deworming, and improved husbandry and welfare practices; better record keeping and information management; and nutritional counseling. These interventions—as a result of the reduced disease and mortality—will increase the number of successful pregnancies, the number of calves born, the average daily weight gain of animals, and the number of calves marketed (see Appendix A for baseline and expected improvements over the duration of the Program). Through all these interventions, the profitability of raising cattle should increase and be reflected in increased income for individual and household cattle farms. Addressing production diseases and improving feed ration balancing will also contribute to improving natural resource use efficiency and reducing GHG emissions per unit of product (see section 2.2.3. below).

## 2.2.2 Results Area 2. Scale Up the Farmer-Centric Service Delivery Model

23. This results area aims at incentivizing the scaling up of the farmer-centric model and building a competitive production base in which farmers have improved productivity and adopted good agricultural practices for animal and grassland management. The Program will expand access to knowledge and significantly boost the agricultural advisory and knowledge transfer programs in Kazakhstan (DLI 3); it will also incentivize the development (new and extension) of individual farms implementing good agricultural practices and connected to meat-export supply chains (DLI 4).

*DLI 3. Small and medium farmers have been trained and certified in Good Practices in the amounts and as set forth in the Disbursement Formula.*

24. **Agricultural advisory and knowledge transfer services relevant to the livestock sector in Kazakhstan are provided by three types of providers.** The first and the largest advisory service provider is the National Agrarian-Science and Education Center (NASEC)—a national holding organization of all major public agricultural research and education institutions. Institutions within NASEC develop content, knowledge materials, and demonstration programs for agricultural advisory services.<sup>2</sup> In this setup, NASEC

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<sup>2</sup>This list of five institutes, two universities, and one experimental station include: (1) the Kazakh National Research Institute of Livestock and Fodder Production, (2) the Branch Scientific and innovative center LLP of Kazakh Scientific Innovation Institute for Animals and Feed Production in Nur-Sultan, (3) the South-Western Research Institute of Livestock and Horticulture, (4) the North Kazakhstan Research Institute of Agriculture, (5) the Kostanay National

plays the role of the knowledge service provider, supplying trainers, knowledge, facilities, farmer contacts, equipment, and so on. The National Chamber of Entrepreneurs (Atameken) is in charge of logistics, linking with farmers, and knowledge needs analyses.

25. **The second type of advisory service providers are national breeding associations (e.g., Hereford, Angus, Kazakh Whiteheaded cattle, etc.) and the union/association of farmers.** These associations organize breed-specific training and capacity building programs for their members. In most cases, the members are farms that are registered as breeding farms.

26. **The third type of advisory service providers are private firms or individuals, which are contracted by mostly large farmers or sometimes by associations to provide specific, demand-based advisory services.** While advisory programs by NASEC are entirely free of charge, the programs through associations and private service providers can be on a fee basis.

27. **Current extension, advisory, and knowledge transfer programs are largely inadequate.** The current approach is criticized to rely on one-off/in-door lectures, use outdated training material, and schedule at dates conflicting with the agricultural calendar. In addition, the current system only reaches a limited part of the farms: Jointly with Atameken, NASEC delivers advisory services (trainings, demonstrations, consultations) to nearly 6,000 individual and household cattle farms per year. On the other hand, the demand for such advisory services was confirmed by a survey conducted during preparation (over 80 percent of interviewed beef producer express interest), as well as by exit surveys conducted by NASEC and other services providers. The main issue is the relevance or the curriculum and training methods, as well as the ability to reach out to more farmers and fulfil the demand despite the geographical spread of producers.

28. **The Program will support the quality improvement and scale up of NASEC's agricultural advisory and knowledge transfer programs for the beef sector.** The Program will provide resources and technical assistance to revise curriculums on animal husbandry and grazing management and to integrate state-of-the-art knowledge in these areas. The knowledge transfer and technical advisory system will rely on the good practices developed for grassland management and animal husbandry.<sup>3</sup> National research and development capacity available at NASEC and other institutions, such as private sector organizations, will be mobilized toward developing good practices and monitoring their effectiveness in view of their continuous improvement. The Program will also provide the resources to pull in relevant international experience in the development of sustainable beef systems. Technical assistance will also be mobilized to revise the approaches to technical and extension service delivery, shifting to more flexible, participatory, and hands-on approaches. Differentiated approaches will be established for the three subcategories of farmers included in the DLI target of 100,000 farmers trained: 20,000 new individual farms (to benefit from intensive technical coaching tailored to the initiation/expansion phase of their business), about 27,000 existing individual farms (to benefit from periodic technical support tailored to cow-calf operations), and about 53,000 household farms (receiving training on specialized beef farming and support to planning investment in that activity and related technical transition). A pool of 50 trainers selected from NASEC staff will represent the backbone of the knowledge transfer system and will be

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Research Institute of Agriculture, (6) Aktobe Experimental Farm, (7) the West Kazakhstan Agrotechnical University, and (8) Pavlodar State University.

<sup>3</sup>Preparation of the good practices is being initiated by the Program preparation team drawing on resources from a grant from the Korea Green Growth Trust Fund that was secured with the objective of mainstreaming green growth in the proposed Program.

trained to that effect, by national and international experts. The Program will also support the development of the national network of model farms and agricultural competency centers that will host the trainings, as well as the implementation of farmer field schools for household farms. Revisions to current extension programs will be made to ensure that female farmers equally benefit from the improved services and their provision. NASEC will also partner with local associations (such as Atameken, the Rural Women's Association, the Green Coalition, breeder associations, and others) to better address farmers' expectations and needs and to provide access to interested farmers. The Program will also introduce feedback loops to measure satisfaction with and adoption of the received training and knowledge transfers. These feedback loops will be used to further improve training content and delivery. Adoption will also feature as a pre-condition for access to other parts of the State Program (also see DLI 5).

*DLI 4. The number of small and medium farmers participating in the Sybaga Program and selling cattle to feedlots has increased in the amounts and as set forth in the Disbursement Formula.*

29. **Currently, investors wanting to establish new individual farms or expand their production units face issues of access to land, finance, and advisory services.** Individual and household farmers are typically not able to solve land access issues or to navigate the complex administrative processes to apply for public support, which is provided on a first-come first-served basis. As a result, state support programs and subsidies have traditionally not effectively contributed to implementing the government's farmer-centric approach. An analysis of payments made to cattle farmers in 2019 shows that the payments reached only a few farmers—no more than 12,000 farmers (including large agri-enterprises) in 2019, out of an estimated 230,000 individual farms and 1.6 million household farms owning cattle (see Appendix B).

30. **The Program will support activities that facilitate individual and household farms' investments in the meat sector.** Awareness-raising campaigns will be financed to improve knowledge about the Program and the financial viability of export-oriented animal production. Public support programs will be amended to offer options better suited to individual and household farmers, and clearer and more transparent application and selection processes will be developed. Under the Program, tailored business development and technical advisory systems will also be provided to new and expanding individual farms.

31. **The Program will not augment public support provided to feedlots and slaughterhouses but instead will leverage private sector investment in this type of operation.** Under the Program, the provision of public services and financial support will benefit individual and household farms, in line with the GoK's farmer-centric approach. The financial viability of these production units depends on their capacity to sell calves to feedlots and thus connect to export-oriented meat value chains. The Program will not, however, provide direct subsidies to downstream activities such as feedlots, slaughterhouses, or meatpacking operations. It will remove the main identified barriers to large-scale private investment in these facilities: enable access to the international market (through a traceability system and delivery of export certificates) and enable access to a reliable source of healthy and high-genetic-quality calves. For example, Tyson Foods, a US meat producer, has announced it will enter the sector and invest in slaughtering and marketing facilities, and asked for improvements on the traceability and health certificates systems—to be supported by the Program. In December 2019, the firm signed an agreement with the Government of Kazakhstan to build a beef plant in the form of a 2,000 head-per-day slaughterhouse (Financial Times 2019).

32. **The Program will ensure that the increase in land use for beef cattle farming is done sustainably.** At the national level, 56 million hectares of pastures are used under private property or lease, and 17

million hectares under common lands. It is estimated that between 120 to 130 million hectares of pasture lands could be usable if drinking water for the livestock can be made available. This provides an expansion potential of about 47 to 57 million hectares (or 64 to 78 percent). Although data are uncertain, the available grassland reserve is largely located in semi-desert to desert areas, which raises concerns on competitiveness and sustainability. Through the Program, national beef production will increase by 47 percent. To manage the environmental impacts of this growth, area expansion will be conducted judiciously and combined with sustainable, productivity-enhancing measures on existing production areas (key elements for productivity increases are described below).

33. **The Program will promote the adoption of good practices on new and existing farms to enable increased yields and improved environmental management on grasslands and animals.** The Program will address the five main constraints to productivity gains: inadequate feeding and access to water (the most important issues being ration balancing, fodder quality, and winter feed supply); pasture productivity (currently limited because of poor grazing management practices); animal genetics; reproduction management; and animal health (FAO 2010; Petrick and Oshakbaev 2015). Diminishing these five constraints is expected to reduce the land area that would be required for new operations by 16 to 20 percent (see Table 2.2) and thus reduce need to expand overall pasture area (especially in remote and low-fertility areas), and still achieve the targeted growth in meat production. The good practices will also mainstream environmental stewardship, especially as they relate to GHG emissions, biodiversity, and nutrient-based pollution and water cycles, in line with the principles of sustainable livestock management (World Bank/FAO 2019).

**Table 2.2.** Hectares required for a standard operation of 100 adult cows, depending on agro-ecological region: Two productivity scenarios

Agroecological region	Area required to produce feed (ha), current productivity				Area required to produce feed (ha), with yield gains achieved under the Program			
	Grass	Hay, silage & legumes	Grains	Total	Grass & hay	Hay, silage & legumes	Grains	Total
Forest steppe & steppe	1,082	214	24	<b>1,321</b>	866	171	19	<b>1,056</b>
Semi desert and desert	1,441	405	37	<b>1,884</b>	1,153	324	29	<b>1,506</b>
Small hills / foothill plains / mountain pastures	1,445	186	18	<b>1,649</b>	1,156	149	14	<b>1,319</b>

*Source:* World Bank, based on various information sources, including estimated yield provided by the Livestock and Fodder Research Institute.

*Note:* ha = hectares.

### 2.2.3 Results Area 3. Implement Green Growth Policies for the Beef Sector

34. This Results Area will provide support for a gradual transition to policies and agricultural support programs that promote productivity and competitiveness of the livestock value chains and at the same time reduce the pressure on environment and mitigate climate impacts. The Program will incentivize the livestock sector's state support with climate co-benefits for individual and household farms; it will develop

so that the growth of the sector is decoupled from the growth of its negative environmental and climate impacts.

*DLI 5. Share of public expenditure in support of green growth and sustainability in the beef sector.*

35. **In 2019, about US\$332 million were spent in agricultural support measures and payments to cattle farmers, with some consideration in promoting an environmentally sustainable growth of the sector (see Appendix B for detailed information).** About 20 percent of the state support for the cattle subsector development can be directly related to positive environmental outcomes, through efficiency gains in production (improving natural resource use efficiency), improved grazing management, and waste management. Measures that promote expansion without productivity gains mostly result in negative environmental outcomes since they will result in an increase of natural resource use and emissions that is proportional to the growth of production (contrary to productivity gains that typically allow to decouple production growth from increased natural resource use and emissions).

36. **To strengthen the environmental outcomes, the Program will support the development of environmental criteria and the development of new lines of support measures.** Environmental criteria will be developed and progressively enforced as conditions to access public support. These criteria will address grazing management practices (with effects on biodiversity, climate change adaptation, and net GHG emissions), animal feeding practices (with effects on GHG emissions), and manure/waste management (with effects on water pollution and GHG emissions). The criteria will initially be enforced on larger and new farms, then on smaller and existing farms. They will ensure that, progressively, all farms benefiting from public support will comply with basic management criteria that generate climate change adaptation and mitigation co-benefits. In addition, the Program will support the establishment of new lines of policies to incentivize investments and practice changes not addressed by the criteria above. Examples include the adoption of energy efficient equipment on farms, live fences, biogas and other manure management/processing on feedlot operations, and the practice of late harvest of fodder to preserve wild birds' nests.

*DLI 6. The Borrower has made commitments for the control of GHG emissions and adaptation to climate change in the beef sector.*

37. **The program will support the mainstreaming of the livestock sector in climate adaptation and mitigation policies.** This will include the revision of the Nationally Determined Contribution (NDC) and the development of a national adaptation plan for the livestock sector.

38. **Kazakhstan's NDC sets an economywide unconditional target of 15 percent reduction in GHG emissions by 2030, compared to the base year of 1990.** GHG emissions in the early 1990s were rather low because of the economic recession, but picked up in the 2000s, as the economy started growing. As a result, estimates provided by the Ministry of Ecology, Geology and Natural Resources (MEGNR) indicate that, in 2019, the country's emissions already exceeded the NDC emission target for 2030. Although the 17.53 million metric tons of CO<sub>2</sub>eq of direct emissions from livestock account for only about 8 percent of the total national GHG emissions (but 80 percent of national agriculture emissions), an increase in emissions from the sector would further jeopardize Kazakhstan's capacity to achieve its target.

39. **The Program will thus support a roadmap for including livestock sector mitigation targets in the Nationally Determined Contributions (NDC).** Drawing on trust fund resources,<sup>4</sup> the Program will support the preparation of ex-ante modeling of mitigation options and mitigation costs toward the definition of livestock specific targets.

40. **Monitoring and reporting of net GHG emissions will also be supported by the Program.** To date, no specific system is in place to report emissions from the livestock sector on a periodic basis, with a level of granularity that allows improvement in management practices (i.e., IPCC Tier 2; see IPCC 2019). Drawing on the trust fund resources described above, the Program will support the development of a specific monitoring, reporting, and verification (MRV) system for the livestock sector. This activity is ongoing at the time of preparation of the Program and should be completed during the first year of Program implementation. Using that system, the Program will monitor emissions and sequestration throughout implementation as part of the monitoring and evaluation (M&E) plan. The data and monitoring system to be used to demonstrate net mitigation of the Program will further form the basis on which to update the NDC and develop the related road map.

## 2.3 Climate Change Mitigation and Adaptation

### 2.3.1 Mitigation of GHG Emissions

41. **The Program will support climate change adaptation and mitigation throughout the three result areas.** The Program will essentially shift the sector’s growth from the current purely expansion-based approach described in the government’s long-term Livestock Strategy toward an efficiency-based approach that will reduce area expansion, prevent GHG emission increase, and foster carbon sequestration (Tables 2.3 and 2.4).

**Table 2.3.** Mitigation and adaptation co-benefits associated with the DLIs

Disbursement-Linked Indicator	Climate Change Benefits	
	Mitigation	Adaptation
Cattle are being registered in the unified information system for traceability, genetic improvement, and animal health control. (DLI 1)	The animal identification and recording systems will accelerate genetic improvements. The information system will include recordings of animal-specific GHG emission performance that will be used for breeding purposes. Genetic improvements are also important drivers to increase productivity, and hence reduce GHG emissions per unit of product (de Haas et al. 2018).	A unified animal identification and recording system provides information on extreme weather events and emerging diseases related to climate change. The data are analyzed and used to develop adaptation strategies and train veterinarians.
Small and medium farmers have access to improved and upgraded veterinary	Animal disease control improves production efficiency and animal and herd levels and thus reduces GHG emissions per	Small-scale farmers are often the most vulnerable to climate change and will particularly benefit from improved animal

<sup>4</sup> A grant from the Korea Green Growth Trust Fund was secured with the objective of mainstreaming green growth in the proposed Program. The grant will contribute to increase awareness of Green Growth for livestock development, shift government expenditures toward ‘green’ support measures, and promote public and private investments with positive environmental externalities and climate co-benefits.

services. (DLI 2)	unit of product (Gerber et al. 2013). Small-scale farmers are those with highest potential for productivity increase through improved animal health.	health services and existence of emergency and contingency plans. Veterinarians access specific information on the control of emerging diseases and stress caused by extreme weather events.
Small and medium farmers have been trained and certified in Good Practices. (DLI 3)	Improvement of advisory systems will improve access to knowledge and technologies, which promote adoption of improved practices.  The practices disseminated, if adopted, will directly contribute to net emission reduction: improved feed balancing and feed digestibility (reduced enteric methane); improved manure management (reduced methane and nitrous oxide emissions); improved grazing practices and restoration of degraded soils (carbon sequestration); adoption of energy efficient equipment and renewable energy generation (reduced fossil fuel use); and improved storage and reduced food and feed losses (reduced waste-related losses).	Improvement of advisory systems will provide access to knowledge and technologies for climate change adaptation and building climate resilience.  The advisory systems will share information on climate smart pasture management, increased landscape connectivity and biodiversity conservation through live fences, soil conservation and management practices; improved animal health practices, strategies for enhanced preparedness and contingency plans for climate-related disasters (e.g., establishing early warning systems, feed stockpiles, etc.), fodder harvesting and conservation, management of waterpoints in pastures, offtake of young males for fattening in feedlots.
The number of small and medium farmers participating in the Sybaga Program and selling cattle to feedlots has increased. (DLI 4)	New farms are expected to have higher adoption rates of improved practices than trained existing farmers given the intensive training and conditionality of public support. Effect of practices on mitigation is as described above.	New farms are expected to have higher adoption rates than trained existing farmers given the intensive training and conditionality of public support. Effect of practices on adaptation is as described above.
Share of public expenditure in support of green growth and sustainability in the beef sector. (DLI 5)	Under the Program, farmers will need to fulfill environmental criteria to access public support. They will include elements such as animal feeding, manure management, and grassland management, which will result in GHG emission reduction.  Some new lines of support measures, e.g., for manure management and plantation of live fences, will also contribute to net GHG emission reduction.	
The Borrower has made commitments for the control of GHG emissions and adaptation to climate change in the beef sector. (DLI 6)	Strengthens and formalizes national commitment to mitigation in the livestock sector, e.g. NDC, MRV, roadmap.	The Program will develop the preparation of a National Adaptation Plan for the livestock sector.

Note: DLI = disbursement-linked indicator.

**Table 2.4.** Climate and other environmental benefits addressed by the good grassland management and animal husbandry practices

	Climate Change Benefits		Other Environmental Benefits
	Mitigation	Adaptation	
<b>Good grassland management practices</b>	Rotational grazing increases carbon sequestration. <sup>a</sup>	Rotational grazing improves organic matter content in pastures and	Rotational grazing and avoided land degradation contribute to maintaining grassland biodiversity.

	· Live fences sequester carbon above and below ground.	· thus nutrient and water retention.	· It also increases vegetation cover, with benefits for water cycles.
	· Use of renewable energy sources for grazing equipment and water points.	· Live fences provide shelter for livestock.	· Live fences and planting trees and shrubs in pasture (landscape restoration) provide shelter for biodiversity, limit wind erosion, and reduce water runoff.
<b>Good animal husbandry practices</b>	· Feed management improves digestibility and balancing of the ration.	· Hay harvesting and storage facilities improve winter feeding.	· Proper manure collection, storage, processing, and application reduce nutrient-based soil pollution as well as ammonia emissions.
	· Covered manure management and manure application systems.	· Concentrate feed storage and use improves winter feeding and animal conditions.	· Improved feed conversion ratio limits the amount of land and water used per unit of production, thereby reducing the relative land and water footprint of the sector.
	· Use of biogas and other renewables generates energy on farm are substitute fossil fuel use.	· Water-efficient irrigation and drinking systems.	

*Note:* a. Increasing soil organic carbon (SOC) stocks under perennial grasses relies mainly on enhancing carbon inputs from plant roots and residues. Ranchers may achieve this by managing plant biomass removal from grazing or increasing forage production. To improve productivity and soil condition on grazing lands, the Program will promote the adoption of intensive grazing practices employing high animal stocking rates for short durations, from a few hours to a few days, on an area of pasture, with frequent movement of animals and relatively long “rest periods” for the vegetation between grazing events. Adapted from Paustian et al. 2019.

42. **The Program is estimated to contribute to the net mitigation of GHG emissions from the livestock sector in Kazakhstan by 5.6 million tons CO<sub>2</sub>eq over the five years (see Appendix C for detailed computation).** This is achieved by combining three emission mitigation approaches supported by the Program.

- First, the adoption of better feeding practices, reproduction management, improved breeds, improved animal health, and the offtake of animals having reached optimum slaughtering weight will generate productivity gains at animal and herd levels and decrease GHG emission intensity (i.e., emissions per unit of product).
- Second, increased soil carbon sequestration will be achieved through the adoption of improved grazing management practices, which allow more reactive management of grazing pressure (in time and space) that contributes to improving grass growth (Lal 2009). Abundant literature quantifies the potential to sequester carbon in soils through improved grazing management (Conant et al. 2019; IPCC 2006). Literature also points to a risk of reversal if improved practices are discontinued, and to the potential saturation of soils that may not be able to accommodate additional carbon after decades of implementation of the good practices. The improved grazing management practices promoted under the Program generate productivity gains and greater financial returns to farmers, so it is assumed that these practices will be continuing (see the economic analysis in Appendix E).
- Third, the adoption of energy-efficient equipment on farms and the production of renewable energy reduce and displace fossil fuel energy consumption.

43. **Table 2.5 summarizes the estimated effect of these mitigation approaches (see Appendix C for detailed computation):** (1) adopting productivity increase practices reduces GHG emission growth by 39 percent compared to an expansion scenario; (2) soil carbon sequestration resulting from the adoption of good grazing management practices can more than entirely offset the GHG emission increase from

production growth; and (3) the adoption of energy use efficiency and renewable energy technology can reduce emissions, but by a very modest proportion.

**Table 2.5.** Summary of GHG emissions and carbon sequestration assessment under the Program, and in the baseline scenario

Year	2021	2022	2023	2024	2025	Total
	(million tons CO <sub>2</sub> eq)					
<b>Program</b>						
Growth in GHG emissions	0.6	1.2	1.8	2.4	3.1	9.2
Carbon sequestration	1.0	2.1	3.1	4.1	5.2	15.5
Fossil fuel displacement	0.01	0.03	0.04	0.05	0.07	0.20
<i>Net emissions under the Program</i>	<i>-0.4</i>	<i>-0.9</i>	<i>-1.3</i>	<i>-1.7</i>	<i>-2.1</i>	<i>-6.4</i>
<b>Program compared to baseline</b>						
Net emissions baseline	1.0	1.9	2.9	3.9	4.8	14.5
Net emissions Program	-0.4	-0.9	-1.3	-1.7	-2.1	-6.4
<i>Net emissions reduction (Program versus baseline)</i>	<i>1.4</i>	<i>2.8</i>	<i>4.2</i>	<i>5.6</i>	<i>7.0</i>	<i>20.9</i>

### 2.3.2 Adaptation to Climate Change

44. **The beef value chain is vulnerable to climate change.** Individual and household cow-calf operations are grazing systems that will be directly affected by climate change, given their dependence on climatic conditions and the natural resource base, and their limited adaptation opportunities (limited access to information, technology, and capital) (FAO, no date).

- Direct impacts related to the climate change prediction in Kazakhstan include increased frequency of extreme weather events; increased frequency and magnitude of droughts and floods; productivity losses resulting from physiological stress due to higher temperature and change in water availability, which is anticipated in the region (USAID 2017).
- Indirect impacts of climate change on cow-calf farms include the alteration in fodder quality and quantity related to the changing climatic conditions and the change in host-pathogen interaction resulting in an increased incidence of emerging diseases.
- Feedlot operations will also be affected. Shifting agriculture zones; crop land degradation related to reduced soil moisture, heat stress, and drought; and increased incidence of pests and diseases are likely to reduce average grain yields and increase variability of production (USAID 2017). This will affect prices and thus production costs at feedlots.

45. **As shown in Table 2.3, Program activities in support of all six DLIs will directly or indirectly contribute to adaptation of the beef value chain to climate change** (e.g., the development of a NAPA), or generate adaptation co-benefits. Adaptation will be achieved through more effective public support system, and improvements in pasture productivity, feed management and storage, and capacity to manage emerging diseases. Adaptation strategies will be developed at three levels:

- Individual and household farms: Adoption of good practices that improve resilience and adaptation (see Table 2.4)

- Service provision: Improvement of an animal recording system and development of unified information system that will enable the monitoring and control of emerging diseases related to climate change and of the improvement of animal health, which increases animal’s resilience to extreme weather events.
- Preparedness and policies: Adoption and funding of a National Adaptation Plan for the beef sector as part of the State Program
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## 2.4 Implementation Arrangements

46. **The government’s implementation capacities were found generally adequate.** The government has been actively supporting the development of export-oriented agricultural sectors, including the beef sector. Recent growth in beef exports demonstrate the adequate overall implementation capacity of the government. As assessed by the OIE, the government has a strong veterinary network that is able to address animal health emergencies. The government has also been successful in introducing a traceability system. While currently several systems (animal health, movement, and genetics) are functioning separately, the investments in technology, design, and human resources for the operation of the traceability system allow the government to provide basic public functions.

47. **A Program management office (PMO) will be housed in the MoA.** It will be responsible for the overall implementation and coordination of the Program as well as for M&E. The PMO will be funded through the general operational budget of the MoA; the staff of the PMO will be civil servants. The PMO will ensure that its 2021–25 state budget requests include operational costs (M&E, external verification, technical experts, required audits, and others) for the Program implementation. The PMO Director will report directly to the Deputy Minister of Agriculture; (s)he will coordinate procurement and supervision of verification activities, consolidate Program reports, and serve as the main counterpart for the World Bank. Specialized technical experts could be hired as part of the overall PMO team, if required. Table 2.6 provides an overview of key implementation entities.

48. **The Program will provide resources for PMO capacity building.** Development areas will focus on the management element of the PMO mandate (e.g., preparation of workplans and budget, M&E, reporting) as well as on the technical elements (e.g., international beef value chains and market trends, climate smart agriculture) and analytical methods (e.g., statistical analysis, ex-ante and ex-post policy analysis). A grant from the Korea Green Growth Trust Fund secured with the objective of mainstreaming Green Growth in the proposed Program will be mobilized for the early initiation of these capacity development activities.

49. **MoA will be responsible for coordination of training activities.** MOA will involve national-level service providers, who will use existing training facilities and educational centers in the regions to organize trainings. Extension policy and budget application will continue to be managed by the Strategy Department in the MoA. The MoA’s Information Technology Department will operate state-owned databases related to animals, including pedigree animals’ identification and registration and delivery of state services in agriculture. The cost tables for the operational costs of the Program implementation are included in the Program Operations Manual of the Program.

**Table 2.6.** Key implementation entities

Results Area/DLI	Responsible Institution	Partners	Notes
<b>Results Area 1. Improve Veterinary Service Delivery and Animal Recording</b>			
<b>DLI 1.</b> Cattle are being registered in the unified information system for traceability, genetic improvement, and animal health control.	Ministry of Agriculture (MoA)	Private data service providers, digital platforms (e.g., Qoldau.kz)	The IT department at the Livestock Department will develop and link current databases. The MoA will develop and approve a roadmap for integrated animal identification and recording system development. Contracts will also be issued to the private sector for the development of ICT applications (Qoldau.kz).
<b>DLI 2.</b> Veterinary services addressing production diseases are made available to small and medium farmers.	MOA, through Committee for Veterinary Control and Supervision ( <i>hereafter</i> Veterinary Committee)	National Agrarian Scientific-Educational Center (NASEC), Kazakhstan National Agrarian University, others	The MoA, with support from the Veterinary Committee will develop the new pieces of regulation. The Veterinary Committee will allocate funds to private veterinarians for the delivery of selected animal health services and coordinate the training of private veterinarians under overall supervision of the OIE.
<b>Results Area 2. Scale Up the Farmer-Centric Model</b>			
<b>DLI 3.</b> Small and medium farmers have been trained and certified in Good Practices in the amounts and as set forth in the Disbursement Formula.	MOA	Atameken (Chamber of Entrepreneurs), unions and associations, universities	Advisory service providers will develop new curriculums and deliver trainings and the advisory services. The strategy department at the MOA will be responsible for the preparation of extension policies. Contracts may also be issued to private trainers and private extension workers to reach out to the large number of beneficiaries.
<b>DLI 4.</b> The number of small and medium farmers participating in the Sybaga Program and selling cattle to feedlots has increased in the amounts and as set forth in the Disbursement Formula.	MOA	Akimats (local governments)	Although outside the Program, the Agrarian Credit Corporation (ACC) will take responsibility for credit disbursements and reporting.
<b>Results Area 3. Implement Green Growth Policies for the Beef Sector</b>			
<b>DLI 5.</b> Share of public expenditure in support of green growth and sustainability in the beef sector.	MOA	Akimats	The PMO will facilitate a working group on the development of environmental criteria, to ensure collaboration between the MOA and the Ministry of Ecology, Geology and Natural Resources (MEGNR).
<b>DLI 6.</b> The Borrower has made commitments for the control of GHG	MEGNR	MOA	The MEGNR is responsible for the revision of the NDC..

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emissions and adaptation  
to climate change in the  
beef sector.

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*Note:* ACC = Agrarian Credit Corporation; NDC = Nationally Determined Contribution; MEGNR = Ministry of Ecology, Geology and Natural Resources; MoA = Ministry of Agriculture; OIE = World Organization for Animal Health; PMO = Program management office.

## 2.5 World Bank Added Value

50. **The World Bank brings highly relevant international sector and policy experience and expertise to the Program.** It is focusing on upstream animal production and value chain support. At the institutional level, the Program will help improve the planning, targeting, and phasing of policies to support the government's vision of boosting exports. At the level of individual and household livestock farmers, the Program will support and strengthen the government's farmer-centric approach. It will help to improve productivity and create space for the private sector to invest in the feedlot and meat processing sectors. The World Bank will also work with the government to improve the expenditure framework by advising on the targeting of state expenditures to mitigate negative climate outcomes and improve sustainable environmental outcomes.

51. **The World Bank's engagement has already brought reputational benefits to the sector, helping to attract private investors and positioning products for international markets.** For example, Tyson Foods, the US meat producer, has announced it will enter the sector and invest in slaughtering and marketing facilities. Tyson Foods linked its investments in Kazakhstan to measures that are supported under the Program for the livestock sector. In December 2019, the firm signed an agreement with the government of Kazakhstan to build a beef plant in the form of a 2,000 head-per-day slaughterhouse (Financial Times 2019).

### 3 Description and Assessment of Program Expenditure Framework

52. **The Program expenditure framework is formed by the central- (republican) and local- (oblast) level budget programs that target the beef sector, which correspond to the results areas of improved veterinary services, traceability, support for beef cattle farm investments, and agri-environmental policies and services.** Consequently, the results areas of the PforR are funded by nine budget subprograms, implemented by the MoA, the institutions/agencies reporting to the MoA (e.g., NASEC), and local governments. In total, these comprise 422 billion Kazakhstani tenge (an equivalent of around US\$1 billion) for 2020–22, for which the current medium-term expenditure framework is approved. Projecting that the budget allocations for these subprograms for 2023 onward will be at least at the level of 2019 brings the total PforR expenditure framework for 2021–25 to 763.9 billion Kazakhstani tenge, or US\$2.02 billion. The details of the program are presented in Table 3.1.

**Table 3.1. Program expenditure framework (in million Kazakhstani tenge)**

Budget Program Code	Budget Subprogram Code	Title of the Program or Subprogram	Program Results Area	2019	2020	2021	2022	2023	2024	2025
				<i>Actual</i>	<i>Plan</i>	<i>Plan</i>	<i>Projection</i>	<i>Projection</i>	<i>Projection</i>	<i>Projection</i>
100		<b>Services for planning, regulation, management in the area of agriculture and land resources use</b>		<b>1,763.1</b>	<b>1,761.3</b>	<b>1,779.8</b>	<b>1,762.1</b>	<b>1,763.1</b>	<b>1,763.1</b>	<b>1,763.1</b>
	104	Information systems and information technology support of the state body	RA1	304.8	204.3	205.2	207.0	304.8	304.8	304.8
	123	Current administrative costs	RA1, RA3	1,346.9	1,523.9	1,528.2	1,555.1	1,346.9	1,346.9	1,346.9
	111	Capital expenditures of the MoA	RA1	111.5	33.2	46.4	-	111.5	111.5	111.5
249		<b>Enabling environment for development of livestock and production, processing, sale of livestock products</b>		<b>9,772.0</b>	<b>7,213.6</b>	<b>9,871.2</b>	<b>9,872.0</b>	<b>9,772.0</b>	<b>9,772.0</b>	<b>9,772.0</b>
	100	Diagnostic studies of livestock	RA1	5,668.4	2,731.6	5,380.4	5,380.4	5,668.4	5,668.4	5,668.4
	101	Anti-epizootic measures, elimination of foci of acute and chronic infectious diseases of animals and birds	RA1	3,773.2	4,005.6	4,014.4	4,015.2	3,773.2	3,773.2	3,773.2
	102	Reference studies on diagnosis of animal diseases, epizootic monitoring and management of the National Microbial Strain Collection	RA1	202.8	334.8	334.8	334.8	202.8	202.8	202.8
	103	Diagnostic on food safety for livestock products	RA1	127.6	141.6	141.6	141.6	127.6	127.6	127.6
250		<b>Improving the availability of financial services</b>		<b>78,273.0</b>	<b>95,103.8</b>	<b>96,195.8</b>	<b>89,970.8</b>	<b>78,273.0</b>	<b>78,273.0</b>	<b>78,273.0</b>
	102	Matching grants for investments in fixed assets	RA2	33,265.5	33,265.5	33,265.5	33,265.5	33,265.5	33,265.5	33,265.5
	106	Matching grants for investments in cattle livestock, machinery, and other technology	RA2	45,007.5	61,838.3	62,930.3	56,705.3	45,007.5	45,007.5	45,007.5
259		<b>Improving the accessibility and the information on pasture, grazeland and other land resources</b>		<b>3,715.5</b>	<b>4,262.0</b>	<b>4,175.5</b>	<b>3,835.5</b>	<b>3,715.5</b>	<b>3,715.5</b>	<b>3,715.5</b>
	100	Compilation of data in of the State Land Cadaster	RA2	3,715.5	4,262.0	4,175.5	3,835.5	3,715.5	3,715.5	3,715.5
267		<b>Improvement of accessibility to knowledge and research</b>		<b>6,352.5</b>	<b>5,638.9</b>	<b>6,704.6</b>	<b>6,704.6</b>	<b>6,352.5</b>	<b>6,352.5</b>	<b>6,352.5</b>
	100	Knowledge transfer and advisory services for agricultural producers	RA2	1,007.2	293.6	293.6	293.6	1,007.2	1,007.2	1,007.2
	101	Program-based financing for agricultural research	RA3	5,345.3	5,345.3	6,411.0	6,411.0	5,345.3	5,345.3	5,345.3
	053	Support for development of pedigree livestock farming, and improvement in productivity and quality of livestock production	RA2	<b>43,883.4</b>	<b>50,289.0</b>	<b>50,540.4</b>	<b>51,225.0</b>	<b>43,883.4</b>	<b>43,883.4</b>	<b>43,883.4</b>
		<b>Total in KZT million</b>		<b>143,759</b>	<b>164,269</b>	<b>169,267</b>	<b>163,370</b>	<b>143,759</b>	<b>143,759</b>	<b>143,759</b>
		<b>Total in US\$ million</b>		380.3	434.6	447.8	432.2	380.3	380.3	380.3

Note: KZT – Kazakhstani tenge; MoA = Ministry of Agriculture.

53. **The expenditure framework includes expenditures necessary for implementation of the results areas, including required scale-ups of key activities.** For the scale-up of the activities, the MoA will prepare concept notes/strategies, which will include the rationale for scale-up, implementation modalities, and expected results. Upon approval of these concept notes, the expenditure framework funding will be amended to include adequate funding for the scale-up. The World Bank will provide support to the MoA to develop the concept notes/strategies through the technical assistance that, in part, will be funded by the Korean Green Growth Trust Fund.

54. **The following expenditure codes and relevant budget programs were prioritized for scale-up as part of the PforR:**

- *Agricultural advisory and knowledge transfer services* (code 267-100) as currently funded will be able to cover knowledge transfer services for only 5,000 farmers per year. DLI 3 aims at substantially increasing the number of farmers covered and improving the quality of the advisory services (see sections above). The operational manual will be approved by the time of Program effectiveness and the government has agreed to allocate sufficient resources to start implementation training programs as of January 1<sup>st</sup>, 2021.
- *The monitoring, reporting, and verification system of GHG emissions* will be included under code 267-101. Additional financial resources are estimated to be limited and the government has agreed to allocate them once the MRV system is developed.
- *Development and the continuous improvement of good practices for animal husbandry and grassland management* will be included under code 267-101.
- *The sourcing of international technical assistance for the various activities to be supported by the Program* will also be included under codes 267-101 and 249-100.

55. **The expenditures under the State Program 2017-2021 to date have been well executed, without overruns.** In 2017 and 2018, the allocated budget was fully used (Table 3.2). No budget subprograms had more than a 10 percent deviation between the approved budget allocation and actual expenditures.

**Table 3.2. Execution of the State Program, 2017–18 (percent)**

	2017 (%)	2018 (%)
Central budget	99.5	99.9
Local budget	99.9	99.8
<b>Total</b>	<b>99.7</b>	<b>99.9</b>

Source: Ministry of Agriculture.

56. **Alignment of the policy objectives, selected priorities, and intended results established in the government’s strategies.** According to the Law on Budget System of Kazakhstan, the State Program 2017–2021 is a Level 2 Program. This implies that the State Program is the primary document that guides agricultural policies, state support measures, and development priorities of the sector. The State Program directly contributes to the government’s high-level strategic objectives for economic development, such as an increase in incomes, decent jobs, and export of non-oil products, and has the primary objective of increasing agricultural productivity and exports by 2.5 times in five years. These objectives of the State Program are fully aligned with the higher-level government policy objectives and the president’s identified priorities for economic development.

57. **Funding of the State Program is provided through the expenditure framework that is mapped**

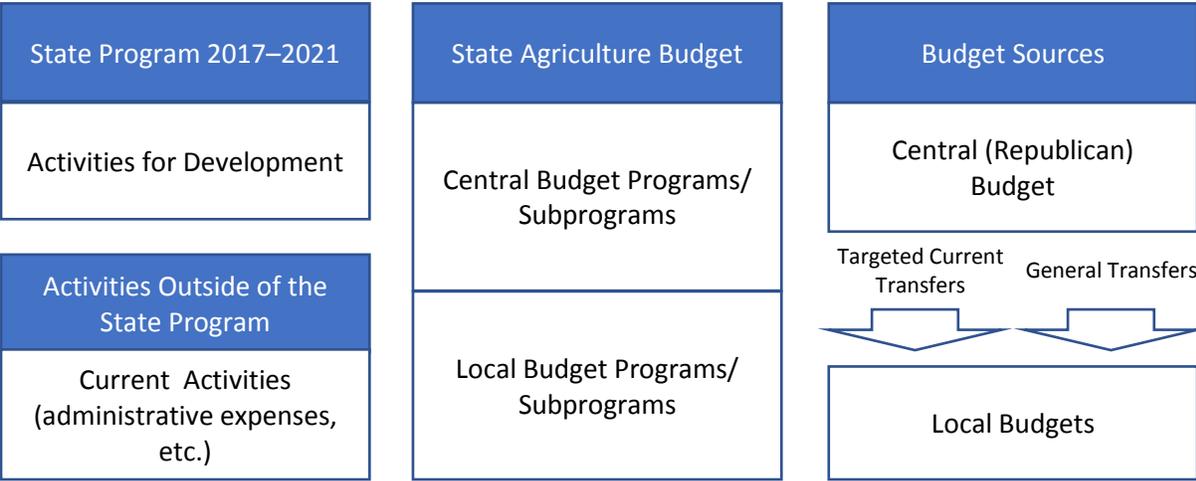
**to three types of budget programs:** (1) provision of public services, (2) transfers between levels of government, and (3) investments and credits (Figure 3.1). Budget programs are divided into “current” programs and “development” programs, corresponding to the difference in a specific budget classification. All budget programs are divided into subprograms for which corresponding performance indicators and results are established.

58. **This structure forms the basis for the implementation of the results-oriented budget management that is required for each program. Results-oriented budgets are implemented for central and local levels.** Budget programs administered by the central government (MoA) are financed from the central (republican) budget, which is approved by Parliament. Results indicators established in the budget programs of the MoA are derived from the results indicators of the State Program 2017–2021. Budget programs administered by the oblast government are financed from the local budget, which is approved by the local representative bodies (Maslikhat). In addition, they receive funds from the central budget through general transfers and targeted current transfers.

59. **Targeted current transfers are reflected in the MoA budget and the MoA develops the Program implementation plans, but funds are transferred to local budget for implementing those plans.** An example of such programs is support for investments in fixed assets for cattle production. The oblast governments follow the MoA program implementation plans and report back to the MoA about their execution.

60. **General transfers are directly transferred to the local budgets, and the oblast governments decide on their allocations based on their priorities.** Most of the general transfers have been used for financing (1) animal health control through vaccinations and anti-epizootic measures; and (2) area payments for crop production, output, and headage payments for livestock production, and credit support.

**Figure 3.1.** Budget allocation process in the State Program



Source: World Bank.

61. **Mechanisms and incentives supporting an efficient service delivery.** The mid-term expenditure framework of the republican budget for 2020–22 was approved by the State Budget Law on Republican Budget for 2020–2022 on December 6, 2019. The MoA budget consists of 9 budget programs and 23

budget subprograms and has a total allocation of 1.0 trillion Kazakhstani tenge for 2020–22.

62. **In 2018, the MoA budget was 266 billion Kazakhstani tenge. In terms of economic classification, it was well balanced.** According to the report of the Ministry of Finance, wages and other personnel costs accounted for 7 percent of total budget. These were followed by capital expenditures, which accounted for 33 percent of total budget, and non-wage recurrent expenditures, which accounted for 60 percent of total budget. Within the non-wage recurrent category, a half of the funds were used for transfers to KazAgro, which provides subsidized credits and other support programs. The other part funded the general support services such as animal health, veterinary services, and food safety and other measures. Future scale up of the service delivery for the livestock sector, especially beef value chain development, envisaged under Program, would require some shift of funds from programs financing support measures that may be considered inefficient to programs financing general support services.

## 4 Description and Assessment of M&E Capacities

63. **The MoA's M&E systems, although strong in selected areas, will need technical assistance in order to ensure confidence in the tracking and achievement of Program indicators (see details in Appendix E).** A review of M&E systems and processes at agencies involved in Program implementation identified as strengths: (1) a strong culture of data collection; (2) a wide range of data collected; (3) good record-keeping systems; and (4) good public access to data. However, significant weaknesses exist in (1) data gaps, especially related to number of households raising cattle, weight of cattle in different cohorts, and amount of calves currently sold to feedlots; (2) data validity—whether numbers represent what they purport to represent; (3) data reliability, as illustrated by a wide range of officially reported numbers for beef exports; and (4) the use of data for evaluation. The MoA publishes annual reports on the implementation of the State Program. However, these reports are published late and often do not provide sufficient evidence for decision making and policy formulation. Several activities are underway to modernize and digitize the MoA's M&E system, including the establishment of a digital platform for monitoring agriculture sector performance and a digital land information system. However, results-based monitoring of national policies and programs has been limited.

64. **Publicly available databases suffer from reliability issues, discrepancies, and data gaps.** Data on private sector activities and on the technical, financial, and environmental performance of businesses along the value chains are often not collected. For example, technical and financial parameters are either unavailable or unreliable, and the data required to compute Tier 2 GHG emission inventories in the livestock sector is also missing. There are also concerns that administrative data does not always match facts on the ground.

65. **The PMO will be responsible for coordination and M&E.** All agencies engaged under the Program (Sybaga, NASEC, Veterinary Committee) will be responsible for collecting data related to the indicators for their respective results areas. They will submit data to the MoA's M&E unit, which will review data for quality and validity and make them available to the independent verification agency. Databases will be stored by the MoA IT department. A third party will be hired by the PMO to verify all DLIs.

66. **Capacity building will be provided and stronger data collection systems developed to track progress on Program goals.** The PMO will include a dedicated M&E expert, and the focus of implementation support missions will be in supporting the client to develop and implement an effective M&E system. M&E capacity building will focus on data quality, data coverage, and analytic capacity. Because of questions surrounding the reliability and accuracy of data provided to the MoA by local level entities (at the Akimat, or local government level), the Program will institute additional data control and verification measures. These measures will involve running surveys, using stratified random sampling to authenticate the data used to inform Program indicators. A key focus area would be on adoption rates and factors that encourage or discourage adoption. Specific data collection at the start of the Program for benchmark indicators to fill in missing values will be outsourced. The Program will also support capacity development at the central level (e.g., in the area of sampling and survey design, statistical analysis, evaluation, and reporting).

67. **The Program will develop a monitoring and reporting system to track net GHG emissions in the livestock sector.** The Program will support the government in developing such system, characterized by (1) the technical and institutional arrangements to collect data on emissions and mitigation actions; (2) documentation of methodologies, assumptions, and data used to estimate emissions; and (3)

standardized reporting templates, protocols, and procedures that are aligned with the IPCC Tier 2 approach and can be used to verify the accuracy of GHG emissions quantifications. This capacity will be developed within NASEC, where most detailed knowledge on livestock production systems is available. Development is initiated during Program preparation, with support of the Korea Green Growth Trust Fund, and is planned to be completed by the time the Program is effective.

## 5 Program Economic Evaluation

68. **The economic analysis identifies benefit streams from cow-calf farms, feedlots, beef exports, and economic returns of avoided GHG emissions.** It focuses on the five years of the Program and meat value chains. The analysis is also extended over 10 years, as it is assumed that the benefits generated during the five years of the Program will extend beyond the Program. The net present value of the Program at 10 years amounts to US\$912.7 million (12 percent discount rate), and to US\$1.307 billion when the economic benefit from reduced GHG emissions is added (see detailed computation in Appendix E).

### 5.1 Kazakhstan Beef Export Competitiveness

69. **An IFC value chain analysis assessing the costs of production (COP) of the Kazakhstan beef sector found that the industry can be competitive in the long run (IFC 2019).** This analysis is based on an assessment of the national industry advantages and disadvantages and a comparison of costs of production in Kazakhstan with other beef exporting countries. According to this analysis, challenges facing the sector include Kazakhstan's remoteness and landlocked geography, its shorter growing season because of the cold climate, fragmentation of production, and the lack of export-capable beef processing. Advantages include large quantities of low-cost suitable pastureland, a well-educated and relatively low-cost labor force, and low-cost key ingredients for fodder. The study concludes that the net effect would depend on production-level technical performance and scale, as well as on specific trade arrangements and transport costs with China, the beef sector's largest potential market.

### 5.2 Farm-Level Profitability

70. **The GoK's Livestock Strategy includes an economic evaluation of a reference cow-calf operation with 50 breeding cows and holds that establishing a new farm of this size is profitable.** This conclusion is based on assumptions of 80 percent fertility rates, annual sales of 15 yearling heifers (at US\$1,067 per head), 20 weaned bulls (at US\$467 per head), and 5 culled cows (at US\$800 per head). It assumes annual revenues of US\$29,333 and profits of US\$12,453, which works out to US\$311 per cow sold. Government assumptions also include funding of almost US\$100,000 met through credits for acquiring property, installing irrigated pastures, and buying heifer calves, plus resources of the employment program and public support for the purchase of farm equipment. These computations and assumptions seem reasonable for new and expanding production units that will benefit from improved advisory services.

71. **Calculations for an IFC study estimated net income (profit) of US\$72,234 for a breeding 200 head cow-calf operation farm, assuming improved farm management practices and better breeds (IFC 2019).** While these figures will vary by cow-calf farm operator and by region (farms in the south will be able to rely more on pastures and less on feed, since they have shorter winters), the MoA considers them to reflect the average for a new farm.

### 5.3 Sector-Level Analysis

72. **This assessment incorporates four elements:** (1) production at newly established cow-calf farms, (2) training impact on productivity and profitability at existing farms, (3) feedlot production and profits, and (4) economic benefits from net GHG emission reduction.

- The assessment assumes that new farms will have zero profits in their first two years, while the farms establish themselves and because they require time for breeding cows to produce offspring and for those calves to grow to their live weight target. It is further assumed that most newly established farms will adopt good practices learned from their training, while only 25 percent of already-existing farms will adopt good practices, at least within the life of the Program.
- Benefit flow on existing cattle farms stems from increased productivity: higher fertility rates, lower disease rates, fewer cow deaths, and more rapid weight gain. These benefits will be achieved through investments in pasture management, animal husbandry, and manure management. Such investments and practice changes will be incentivized by new financial incentives, supported by higher-quality veterinary services addressing production diseases, purchase guarantees, and so on.
- The total production of feedlots is projected to rise from current level of 450,000 to 1.6 million head fattened per year. Animals are expected to be predominantly sources from individual farms. Benefits to the feedlots are in the form of an increased and steady supply of animals. Feedlot profits per animal are set at US\$147, as derived from government calculations of feedlot profitability.
- For GHG emissions, the model assumes that the volume of emissions reduced over the duration of the Program is equivalent to 5.6 million tons of CO<sub>2</sub>eq. Extending the mitigation effect over a 10-year period, using a shadow cost of carbon rising from US\$40 to US\$50 per ton of CO<sub>2</sub>eq over the course of the decade, and a discount rate of 10 percent, the present value from avoided emissions is US\$383,000.

## 6 Technical Risks

73. **The overall risk of the Program and of the technical design of the operation is assessed as Substantial.** This is in view of the technical complexity of the Program, the limited implementation capacities at the MoA, the limited technical capacity at NASEC, and the technical challenges related to developing an export-oriented meat sector out of a sector that, in its current form, is essentially dominated by household farms operating at a low productivity level and producing for domestic markets. The sections below discuss the primary technical risks related to achieving each of the DLIs and activities that will be undertaken to address these risks.

74. **DLI 1. Cattle are being registered in the unified information system for traceability, genetic improvement, and animal health control.** Main risks relate to the reluctance of farmers to register animals in the system and to the limited enforcement capacity of the MoA in a context where production units are dispersed over a vast and poorly connected territory. Through extension service providers and livestock market staff, the Program will raise awareness among farmers about the relevance of registering animals to improve performance and animal health of the national livestock herd and build sustainable export-oriented value chains. Furthermore, access to state support measures and marketing of calves to feedlots will be made conditional on the identification of all livestock on the production unit.

75. **DLI 2. Veterinary services addressing production diseases are made available to small and medium farmers.** The risk is the lack of willingness to pay for veterinary services among individual and household farmers. To address this risk, the Program will support the development of policies including legislation that recognizes and protects private veterinary practice and that includes provisions for private veterinarians to deliver official government veterinary interventions under contract with the government (sanitary mandates); appropriate training of veterinarians; and the existence of a veterinary statutory body that, at a minimum, establishes competency examinations for veterinary graduates as a basis for licensing, establishes an ethical code for veterinary practice with enforcement authority, and sets requirements for continuing education. In addition, some incentives will be necessary and could include business skills training to set up a private veterinary practice as a profitable small business; financial incentives (or favorable loans) to purchase the necessary basic equipment for private practice; and contracting by government with private veterinarians to provide government services (surveillance, testing and vaccination on national disease control programs, and the authority to write health certificates) to supplement their private income, which initially may be uncertain.

76. **DLI 3. Small and medium farmers have been trained and certified in Good Practices in the amounts and as set forth in the Disbursement Formula.** Risks relate to the need to substantially improve the current advisory systems (quantity- and quality-wise) and to the lack of national capacity to implement such change. The Program will provide technical assistance to revise curriculums on animal husbandry and grazing management practices and to integrate state-of-the-art knowledge in these areas, building on relevant international experience. Technical assistance will also be mobilized to revise the approaches to technical and extension service delivery. The current approach, mostly relying on one-off classroom lectures, often scheduled at dates conflicting with the agricultural calendar, will be updated for more flexible, participatory, and hands-on approaches. The Program will also finance the development of demonstration farms, where producers can attend revolving trainings and participate in peer-to-peer learning.

77. **DLI 4. The number of small and medium farmers registered in the Sybaga Program and selling cattle to feedlots has increased in the amounts and as set forth in the Disbursement Formula.** Access to

land and willingness to invest in livestock farming are the main sources of risk. The Program will facilitate awareness-raising campaigns that will be carried out to inform potential investors about investment opportunities in the livestock sector, and new investors will be supported in the development of business plans. The Program will also facilitate technical support in the initial phases of their new/growing production activities.

78. **DLI 5. Share of public expenditure in support of green growth and sustainability in the beef sector.** Under this DLI, the Program will facilitate the development of environmental criteria with which farmers must comply to access public support. Main risks stem from the potential discontent among producers who currently such criteria, and from the need for the MoA, MEGNR, and NASEC to collaborate on the development and enforcement of criteria. The Program will support ex-ante analysis of the costs of compliance with criteria to ensure feasibility and facilitate expert groups from both ministries (and NASEC) to ensure coordination. Under the Program, the MoA will also conduct awareness-raising campaigns to sensitize producers about environmental stewardship and on international consumers' demand for sustainable production.

79. **DLI 6. The Borrower has made commitments for the control of GHG emissions and adaptation to climate change in the beef sector.** The revision of the NDC and the preparation of NAPA require the support of MEGNR and Parliament endorsement. To ease this process, the Program will support background analyses and stakeholder consultations to ensure broad buy-in. Emission reduction targets proposed for the NDC will be based on cost-effectiveness analysis of GHG emission reduction options and modeling of mitigation scenarios. Particular attention will also be paid to ensuring the proper timing of this policy work with regard to national policy- and strategy-making processes.

80. **Access to technical assistance will be essential to a successful Program implementation, as explained above for activities under all three result areas.** A grant from the Korea Green Growth Trust Fund was secured with the objective of mainstreaming Green Growth in the proposed Program. The grant will help to increase awareness of Green Growth for livestock development, shift government expenditures toward green support measures, and promote public and private investments with positive environmental externalities and climate co-benefits. The grant will finance the following technical assistance: development of the MRV system, development of good practices for animal husbandry and grassland management, upgrade of the technical advisory systems, and capacity development among PMO members.

81. **The main actions required to enhance the Program systems and reduce risks are detailed in the Program Action Plan.** These are legally covenanted actions and have been grouped according to the area of concern in Appendix G.

## 7 APPENDIXES

### Appendix A. Detailed Description of Technical and Marketing Changes Achieved under the Program

Table A.1 provides a summary of the technical and marketing improvements to be achieved under the Program and used in this assessment.

**Table A.1.** Technical and marketing impacts achieved under the Program

	2019	2025 with the Program
<b>Animal numbers</b>		
Overall number of cattle (head)	7,150,000	9,638,000
Overall number of cattle of beef breed (head)	2,341,684	5,451,684
<b>Farm numbers and size</b>		
Individual farms with cattle	27,000	47,000
Individual farms selling calves to feedlots	14,000	34,000
Individual farms owning specialized beef breeds	—	27,000
Number of new individual farms supported by the project	n.a.	20,000
Household farms (with or without cattle)	1,635,636	1,635,636
Household farms selling calves to feedlots	700	700
Average size of herd on the individual farms (heads)	68	53
Animals on individual farms total (head)	1,834,897	2,173,308
<b>Production</b>		
Average number of calves sold per individual farms to feedlot (head/year)	17	21
Number of calves sold to feedlots – all	299,000	748,303
Number of calves sold to feedlots – beef breeds	—	673,473
Number of calves sold to feedlots – from individual farms	235,000	282,009
Number of calves sold to feedlots – from household	64,000	37,415

Average live weight at slaughter on feedlots (kg)	500	550
Capacity of feedlots (animal places × 2 cycles)	450,000	935,379
Total beef produced (tons carcass weight)	519,000	666,700
Total beef produced – out of feedlot operations (tons carcass weight)	160,200	246,940
Fertility rates on individual farms progressively adopting good management practices – includes calves' mortality (%)	60	82
<b>Marketing</b>		
Total beef sold on domestic market (tons carcass weight)	477,000	524,700
Total beef sold on export market (tons carcass weight)	42,000	142,000
<b>Production practices</b>		
Individual farms implementing good animal and grassland management practices (number)	1,350	32,400
Household farms implementing good animal and grassland management practices (number)	n.a.	12,500
<b>Land use</b>		
Grassland requirements on farms progressively adopting best practices (ha per head)	8	6.20
Hay requirements (ha per head)	1.25	1.06
Area of grassland managed by individual farmers with cattle (ha)	14,679,183.67	13,474,511
Area of hay managed by individual farms with cattle (ha)	2,293,622	2,309,140
Area of grassland in farms adopting improved practices (ha)	733,959	10,948,150
Area of grassland under actual improved grazing management (ha)	733,959	2,737,037.59
Area of grassland in the Program (ha)	8,811,428.57	12,373,985

Note: n.a. = not applicable; — = not available.

Table A.2 presents the key hypotheses that were made in estimating the effect of the Program on practice changes.

**Table A.2.** Hypotheses made in this assessment

<b>Hypothesis</b>	<b>Value (%)</b>	<b>Comments</b>
Adoption rate of improved practices on 20,000 new individual farms	80	New farms are expected to have higher adoption rates than trained existing farmers given the intensive training and conditionality of public support.
Adoption rate of improved practices on 27,000 existing individual farms	40	None
Adoption rate of improved practices on existing 50,000 household farms	25	None
On farms adopting improved practices: share of grassland effectively managed under improved practices	33	When a farmer generally adopts improved practices, s/he may not apply such practices on all the grassland s/he manages.

## Appendix B. State Support for the Beef Sector

Total state support, which includes credit and co-financing of farm investments, including through National Holding KazAgro, represented more than 80 percent of the MoA budget in 2016 (when water management and forestry-related expenditures of the ministry are excluded). The current pattern of public support for agriculture has been primarily oriented toward increasing production in the main subsectors rather than being designed to raise efficiency or productivity. Several key characteristics that have hindered the overall effectiveness of the current subsidy system in the agricultural sector are its complexity, lack of predictability, limited accessibility, trade and market distortion, and the lack of a feedback mechanism based on impact assessments and evaluations (World Bank Group Joint Economic Research Program 2018).

Livestock production has historically been less profitable than crop production in Kazakhstan, and this is especially the case for the meat sector. To compensate for this, livestock's state support has been generally more generous than the support available for crop production. Total support to the livestock sector represents about 8.5 percent of the total value of livestock production in 2019—a percentage that rose by half over the past five years. Table B.1 provides an overview of the state support provided to farms and business in the beef value chains, from feed mills and pasture managers to slaughterhouses. In 2019, 126 billion Kazakhstani tenge (US\$332million) were spent on this support, reaching between 11,000 and 12,000 producers and businesses.

An assessment of the state support indicates that about 20 percent of the overall expenditure can be directly related to positive environmental outcomes, 6 percent to negative outcomes, and the rest could generate either positive or negative outcomes depending on exact use and local conditions (see Table B.1).

**Table B.1.** State support provided to the beef sector in 2019

	Payment	Number of farmers who benefited from the support	Amount disbursed (thousand KZT)	Share of overall amount disbursed	Contribution to environmental outcomes +/: positive contribution -/: negative contribution +/-: can go both ways
<b>Beef farming</b>					
Selection and breeding					
commercial breeding heifer stock	10,000 KZT/head	11,384	11,865,217	}	<i>+/-: Contributes to efficiency gains through breed improvement. The large-scale import of breeding animals (0.96 million over ten years) also contributes to expansion.</i>
pedigree breeding heifer stock	20,000 KZT/head	965	6,268,497		
Acquisition of domestic pedigree bulls	150,000 KZT/head	4,858	10,561,628		
Acquisition of foreign pedigree breeding heifers	225,000 KZT/head	289	11,076,951		
Keeping pedigree bull-producer of beef breeds used for reproduction of the herd	100,000 KZT/head	938	1,638,900	}	<i>+: Contributes to efficiency gains through breed improvement.</i>
Partial compensation for the cost of bulls that have been sold or transferred to feedlots with a capacity of at least 1,000 head for fattening	200 KZT/kg live weight	2,344	5,746,619	}	<i>-: Fosters expansion.</i>
Partial compensation for the costs of beef production by meat processing enterprises that slaughter and perform primary processing of cattle meat	175 KZT/kg beef	0	0		
Partial compensation of bull fattening expenses of the feedlots with a capacity of 1,000 head at a time	200 KZT/kg weight gain	2,344	5,444,632	}	<i>+: Contributes to productivity gains by incentivizing fattening in feedlot operations.</i>
Total			52,602,444	41.9%	
<b>Procurement of agricultural machinery for fodder and feed</b>					
Total		10,574	45,875,000	36.6%	<i>+/-: Contributes to efficiency gains. May also foster expansion.</i>
<b>Pasture watering infrastructure and water provision for livestock farms (water pumps and storage, renewable energy, housing for shepherds)</b>					
Total		9,776	22,616,000	18.0%	<i>+: Contributes to improved grazing management.</i>
<b>Creation of an artificial pond (borrow pit pond) for collecting snowmelt water</b>					
Total		1	6,000	0.0%	<i>+: Contributes to improved grazing management.</i>
<b>Purchasing equipment to breed agricultural animals for meat farming (general farm machinery and equipment)</b>					
Total		1,862	2,603,000	2.1%	<i>-: Contributes to expansion.</i>
<b>Creation and expansion small cattle-fattening facilities</b>					

Total	0	0	0.0%	-: Contributes to expansion
<b>Creation and expansion of cattle fattening facilities</b>				
Total	3	501,000	0.4%	<b>+: Contribute to productivity gains at fattening stage.</b>
<b>Creation and expansion of slaughtering and meat processing facilities</b>				
Total	18	946,000	0.8%	<b>+: New operations comply with environmental standards</b>
<b>Creation of a feed milling plant</b>				
Total	5	347,000	0.3%	<b>+/-: Contributes to efficiency gains. May also foster expansion.</b>
<b>GRAND TOTAL</b>		<b>125,496,444</b>		
<i>+: positive contribution to environmental outcome</i>		26,252,532	22%	
<i>-: negative contribution to environmental outcome</i>		8,349,619	6%	
<i>+/-: can go both ways for environmental. outcome</i>		91,840,293	72%	

Note: KZT = Kazakhstani tenge.

## Appendix C. Estimated Effects of the Program on Net GHG Emissions

### 1. Introduction

#### 1.1. Context

According to the 2019 Kazakhstan National Inventory Report on anthropogenic greenhouse gas emissions, 6,764,212 cattle and 16,049,807 sheep, respectively, emitted 15.6 and 3.4 million tons of CO<sub>2</sub>eq through enteric fermentation and manure management in 2017. This represents 87 percent of livestock emissions and 55 percent of agriculture emissions. The volume of emissions associated with the respective value chains is nevertheless higher, because it includes additional sources of emissions such as feed and fodder production (fertilization, cultivation, transport, and processing), and energy consumption on production and processing units.

The Program's objective of facilitating the development of an environmentally sustainable, inclusive, and competitive beef production in Kazakhstan will have an important effect on GHG emissions from the sector. In particular, the objective of increasing the number of animals and the expansion of land area dedicated to feed production. This could pose a serious challenge to fulfilling the country's national ambitions regarding environmental sustainability and climate change, and in particular regarding the Nationally Determined Contribution (NDC).

#### 1.2. Objective

The objectives of this assessment are (1) to assess GHG emissions from the cattle and sheep supply chains as of today, and (2) to assess how these emissions will evolve under the Program compared to an estimated baseline growth.

### 2. Methods and Data

#### 2.1. GHG Emissions Calculation and Scope

GHG emissions are calculated following the IPCC Tier 2 methodology, using the FAO Global Livestock Environmental Assessment Model (GLEAM).<sup>5</sup>

GLEAM is a ready-to-use model that simulates the biophysical processes and activities along livestock supply chains under a life cycle assessment approach to quantify production and GHG emissions. All computations are GIS based—that is, all inputs and outputs are global raster layers (maps) with a resolution of approximately 10 x 10 kilometer grid cells at the equator. GLEAM is built on modules reproducing the main elements of livestock supply chains: the herd structure, manure management, feed production, and system integration. The main livestock species (cattle, sheep, goat, buffalo, pig, and chicken) and commodities (meat and milk from ruminant species, pork, meat and eggs from poultry) are included in the model, as well as the main greenhouse gases (CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O) in the context of agriculture.

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<sup>5</sup> See <http://www.fao.org/gleam/en/> for more details about GLEAM.

This assessment includes emissions from the livestock value chains, in line with the scope of the Program. They include emissions from animal production—enteric fermentation (CH<sub>4</sub>) and manure management (CH<sub>4</sub> and N<sub>2</sub>O)—as well as from feed production (N<sub>2</sub>O from fertilization, CO<sub>2</sub> from energy use and fertilizer manufacture) and processing and transportation (essentially CO<sub>2</sub> from energy use).

Although the Program focuses on beef, this assessment includes an assessment of emissions from cattle and sheep. This conservative approach was retained because (1) for cattle, both the specialized beef herd and the dairy herd contribute to the total beef production, and (2) sheep and cattle are generally browsing on the same grassland and a partition of GHG emissions and C sequestration between the two species would lead to substantial uncertainties.

Soil carbon sequestration in grassland is estimated with the IPCC Tier 2 methodology, with the RothC soil model (Coleman and Jenkinson 1996). RothC is a process-based model for the turnover of organic carbon in non-waterlogged topsoil (30 centimeter soil depth) that allows for the effects of soil type, temperature, moisture content, and plant cover on the turnover process. The RothC model is one of the most widely used soil organic carbon (SOC) models and has been evaluated in a variety of ecosystems including croplands, grasslands, and forests and in various climate regions, including semi-arid environments. The model is driven by soil and climate data, C input to the soil (e.g., plant residues and manure), and land use.

The RothC model was used to estimate the SOC sequestration potential under optimal practices and management. The analysis gives a spatially explicit estimate of distribution and increase of SOC through improved practices. Considering the large spatial variability of the SOC stock in Kazakhstan (Figure C.1), the estimated sequestration potential is provided for “degraded pastures” and for “existing, non-degraded pastures” over the five-year time frame of the Program.

## 2.2. Data

For every country, the GLEAM model includes default data on the large number input parameters needed to conduct Tier 2 calculations—for example, on productivity (weights, milk yield), herd dynamics (mortality, fertility, age at first calving, replacement rate), diet composition and characteristics (energy and nitrogen content, digestibility) and manure management. National data sources from the Statistics Committee of the Republic of Kazakhstan and from the Livestock and Fodder Research Institute (LFRI) were used to revise and verify GLEAM parameter values when available in order to refine the calculations for the reference year of 2019. In particular, the following data were used (see also Tables C.1, C.2, and C.3):

- Animal numbers by farm types and by commodity orientation (dairy vs. beef) (Statistics Committee). The Statistics Committee also differentiates between cows (adult female animals) and other types of animals. However, the proportion of cows in the whole herd was not exactly matching the herd dynamics module of GLEAM and small adjustments were therefore needed.
- Live weight by farm type at birth (LFRI) and slaughter (Statistics Committee)
- Availability of fodder resources (Statistics Committee)
- Number of grazing days and feed ration by farm type (LFRI)
- 2019 was used as the year of reference for collecting input data and calculating GHG emissions. In 2019, a warmer and drier than average summer, especially in northern regions, negatively affected crop yields; however, livestock population and production were in line with the growing

trend of the past years.

**Table C.1.** Animal numbers by species and categories of farms in the reference year, baseline, and mitigation scenarios

Animals	Reference year 2019	Program, by 2025	
		Baseline scenario	Productivity scenario
<b>Dairy cattle</b>			
Household farms	3,925,467	3,417,671	3,075,904
Individual farms	882,849	768,645	768,645
<b>Beef cattle</b>			
Household farms	1,537,135	1,556,056	1,400,450
Individual farms	505,549	2,850,355	1,383,338
Feedlots	299,000	1,045,273	1,531,598
<b>Sheep</b>			
Household farms	10,882,668	10,882,668	9,815,050
Family farms	8,176,415	18,475,546	15,959,696

*Data source:* National data sources from the Statistics Committee of the Republic of Kazakhstan and the World Bank.

**Table C.2.** Main cattle herd parameters by categories of farms (for specialized meat farms only) in the reference year and in the Program

Herd parameters	Reference year 2019			Program, by 2025 <sup>a</sup>		
	Household farms	Individual farms	Feedlots	Household farms	Individual farms	Feedlots
<b>Cattle</b>						
Live weight at slaughter (kg)	332	334	500	332	402	550
Percent calves sent to feedlot	12	52		5	90 <sup>b</sup>	
Fertility (including calf mortality)	60	60		60	82	
Replacement rate	21	21		21	15	

*Data source:* National data sources from the Statistics Committee of the Republic of Kazakhstan and the World Bank.

*Note:* a. On farms adopting improved management practices.

b. 72% in the expansion scenario.

**Table C.3.** Main characteristics of the feed ration for beef cattle in the reference year and in the Program

Feed ration characteristics (% of dry matter content)	Reference year 2019			Program, by 2025 <sup>a</sup>		
	Grass hay	Silage & legumes	Grains	Grass hay	Silage & legumes	Grains
Household farms, fattening animals	85	10	5	85	10	5
Household farms, other animals	90	10	0	90	10	0
Individual farms, fattening animals	70	20	10	40	40	20
Individual farms, other animals	80	15	10	60	30	10
Feedlots	20	30	50	20	30	50

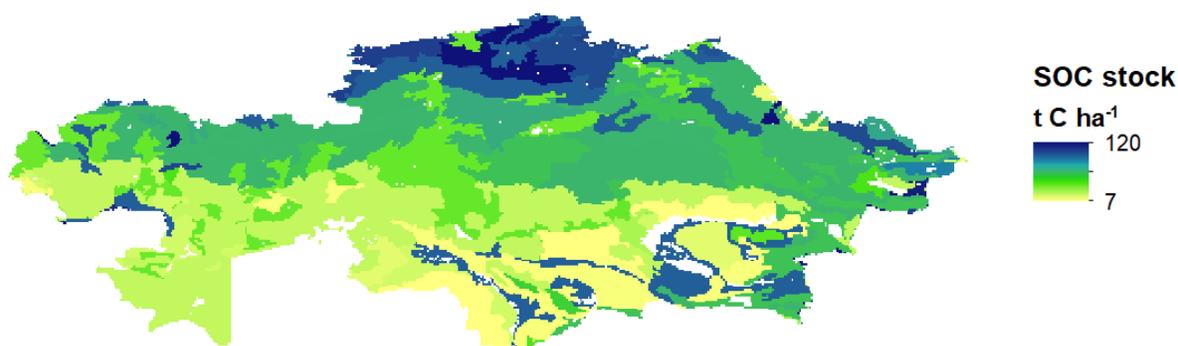
*Data source:* National data sources from the Statistics Committee of the Republic of Kazakhstan and from the Livestock and Fodder Research Institute (LFRI) and Global Livestock Environmental Assessment Model (GLEAM).

*Note:* a. On farms adopting improved management practices.

Regarding soil carbon sequestration, specific input data for Kazakhstan were used to run the RothC model.

The initial SOC stock was derived from the FAO Harmonized World Soil Database (Figure C.1). This source was also used to obtain basic soil characteristics to run the model (e.g., bulk density and clay content). Averaged monthly temperature, precipitation, and evapotranspiration for the period 1980–2010 (Harris et al. 2014) were used to drive the model. Carbon inputs from plant residues and manure were also used as inputs to the model. Both sets of data were derived from GLEAM, with plant residues calculated as aboveground biomass (Haberl et al. 2007) – animal intake. because of the lack of country-specific measurements of input data, comparisons between estimated and measured parameters were not possible. However, all input data were extracted from peer-reviewed sources. Two model runs were performed, one with no change in practices and one with the adoption of improved management practices. The yearly rate of carbon sequestration in the soil was then calculated as the difference, after five years, between the SOC computed for those two models runs.

**Figure C.1.** Soil organic carbon (SOC) stocks at 30 cm depth in the reference year, 2019



Source: Harmonized World Soil Database v 1.2, <http://www.fao.org/soils-portal/soil-survey/soil-maps-and-databases/harmonized-world-soil-database-v12/en/>.

Given the paucity of data, this assessment relies on numerous hypotheses and simplifications. The fact that sequestration rates are applied over vast territories adds to the uncertainty level. Table C.4 presents the key hypotheses that were made in estimating the effect of the Program on soil carbon sequestration. Conservative choices were made at all stages in the selection of parameters.

**Table C.4.** Hypotheses made in this assessment

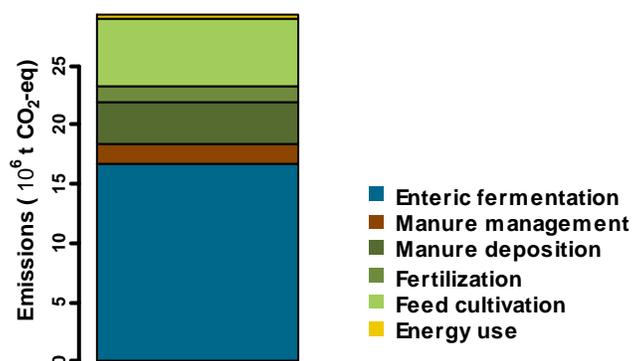
Hypothesis	Value	Comments
Adoption rate of improved practices on 20,000 new individual farms	80 percent	New farms are expected to have higher adoption rates than trained existing farmers given the intensive training and conditionality of public support.
Adoption rate of improved practices on 27,000 existing individual farms	40 percent	None
Adoption rate of improved practices on	25 percent	None

existing 50,000 household farms		
On farms adopting improved practices: share of grassland effectively managed under improved practices.	33 percent	When a farmer generally adopts improved practices, s/he may not apply such practices on all the grassland s/he manages.
Carbon sequestration on grassland managed under improved practices	0.4 t C ha <sup>-1</sup> yr <sup>-1</sup>	Assumption is below the modeled range at national level: 0.6 (SE. ±0.3) t C ha <sup>-1</sup> yr <sup>-1</sup>
Carbon sequestration on grassland managed under baseline practices	0.0 t C ha <sup>-1</sup> yr <sup>-1</sup>	Hankerson et al. (2019) and a recent project report by Michigan state University mention ongoing degradation trends, i.e. a baseline of SOC losses. Still, in line with the conservative approach, stable SOC contents were assumed.

### 3. Emissions in 2019

It was estimated that cattle and sheep supply chains respectively emitted 29.4 and 7.1 Mt CO<sub>2</sub>eq (Table C.5), when considering all emissions along the chain. Methane from enteric fermentation was the first source of emissions; however, other sources (mainly N<sub>2</sub>O from manure deposition in grassland and CO<sub>2</sub> from feed cultivation, Figure C.2) still represented a significant share of total emissions—43 percent for cattle and 39 percent for sheep. Looking at enteric methane and manure emissions only, the estimates computed in this assessment, using a Tier 2 approach, are in line with those reported in the 2019 national inventory, essentially based on a Tier 1 approach: 16.8 Mt CO<sub>2</sub>eq for cattle and 4.3 Mt CO<sub>2</sub>eq for sheep in this assessment, versus 15.6 and 3.4 Mt CO<sub>2</sub>eq respectively for cattle and sheep in the national inventory report (for year 2017).

**Figure C.2.** Base Year GHG emissions from the cattle sector, by sources



Source: World Bank, based on the Global Livestock Environmental Assessment Model (GLEAM).

### 4. Emission Increase and Mitigation Potential under the Program

To estimate potential emission increase under the Program, a baseline scenario was first considered, where the growth in production is mainly achieved through an increase in animal numbers and grassland area, along the lines of the government’s current sector growth strategy.

The Nationally Determined Contribution (NDC) of Kazakhstan submitted in 2015 sets the unconditional emission reduction target to 15 percent by 2030, compared to the base year of 1990. Although all gas and sectors are intended to be covered, no specific actions or references to livestock are mentioned. Therefore, the Program baseline scenario did not consider mitigation targets under the Paris Agreement.

Three cumulative mitigation options promoted under the Program were then assessed for their effectiveness against baseline trends:

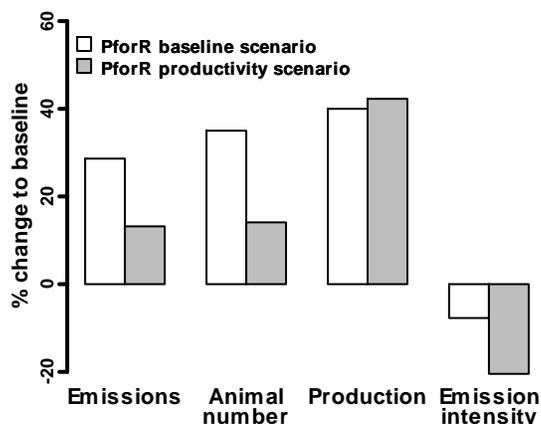
- *Productivity gains*. This mitigation pathway relies on the adoption of improved practices that boost productivity in order to achieve production growth with a lower increase in animal numbers.
- *Improved grazing*. This pathway aims at improving grassland management to increase soil carbon sequestration in order to offset part of the increase in emission associated with the growth of the sector.
- *Renewable energy*. This pathway looks at the mitigation potential associated with the displacement of fossil-fuel-based energy sources (e.g., through the installation of energy-efficient devices on farms and renewable energy generation, such as from biogas, solar panels, wind turbines).

#### **4.1 Potential emission increase under the baseline scenario if production growth was solely achieved through expansion**

In this baseline scenario, no change in production practices or productivity was assumed compared to the 2019 reference year (except for the greater number of calves finished in feedlots). Total GHG emissions from cattle and sheep supply chains after five years would reach 48.5 Mt CO<sub>2</sub>eq, a 33 percent increase compared to the baseline (Figure C.3). Assuming a linear increase over the period, this would result in 36.3 Mt CO<sub>2</sub>eq of additional emissions compared to the baseline, over the five-year time frame of the Program (Table C.6).

For cattle, the increase in meat production after five years in the baseline scenario (+40 percent) was estimated higher than the relative increase in animal numbers (+35 percent) and emissions (+29 percent). Although practices in the different farm types were not changed compared to the baseline, the development of new feedlots resulted in a small increase in productivity and related decrease in emission intensity (i.e., emission per kilogram of meat produced reduced by 8 percent).

**Figure C.3.** Relative changes in beef production and related GHG emissions in 2025 (Program and baseline scenarios, compared to 2019 (reference year))



Source: World Bank, based on the Global Livestock Environmental Assessment Model (GLEAM).

## 4.2. Emission Reductions through Productivity Gains and Manure Management

The Program will tap into the important scope for increasing the total volume of production through productivity gains rather than through the expansion of the herd. In beef production, the average slaughter weight in cattle farms is currently low—many household and individual farms sell calves directly for slaughter. Efficient fattening in feedlots can increase the beef output and hence productivity. In addition, there is room for reducing mortality, improving fertility, and optimizing replacement rates (e.g., through better veterinary practices, artificial insemination, herd management) in order to reduce “unproductive GHG emissions.” Better feeding practices by improving the digestibility and balancing nutrient content of the rations also have the potential to increase productivity while limiting enteric methane emissions.

To assess the mitigation effect of such an approach, input data at herd and feed rations (Table C.3) were changed to reflect an improvement in production practices. Such changes in parameters were defined using LFRI recommendations (on optimal feed rations and their characteristics in particular) and characteristics of LFRI model farms (on herd parameters in particular). The technical assessment of grassland management and feed balance was also used to define improved feed rations. Herd parameters from more-productive neighboring countries (e.g., Russia) were also considered.

Animal numbers in dairy farms and sheep farms were considered unchanged. A 10 percent decrease in animal numbers was assumed in household beef farms, reflecting the opportunity for some household farms to transition to individual farm with support of the Program. Because of improvement in production practices and productivity gains, a lower increase in animal numbers is required (Table C.5).

This “productivity gains” mitigation approach limited total GHG emissions growth to 17 percent compared to the 2019 emissions: 42.5 Mt CO<sub>2</sub>eq from cattle and sheep in 2025. Considering a linear growth in emissions between the 2019 baseline and 2025, this would result in 18.3 Mt CO<sub>2</sub>eq of additional emissions compared to the baseline, over the five-year time frame of the Program (Tables C.5 and C.6).

For cattle in the productivity scenario, it was possible to achieve the same production target as in the baseline scenario (+42 percent) while limiting the increase in animal numbers (+14 percent) and emissions (+13 percent). This was possible through an increase in productivity and decrease in emission intensity (–21 percent). For sheep, a slightly lower potential to reach the baseline scenario targets through productivity gains was found, but this was also due to lower data availability on improved production practices. The productivity scenario for sheep achieved +54 percent increase in production with a 35 percent increase in animal number and 32 percent increase in emissions.

**Table C.5.** Production and GHG emissions in the Program baseline and productivity scenarios compared to the reference year

	2109	2025	
	Reference year	Baseline scenario	Program
<b>Cattle</b>			
GHG emissions (million metric tons CO <sub>2</sub> eq)	29.4	37.8	33.2
Production (metric tons carcass weight)	395,740	553,003	563,338
Animal number	7,150,000	9,638,000	8,159,934
<b>Sheep</b>			
GHG emissions (million metric tons CO <sub>2</sub> eq)	7.1	10.7	9.3
Production (metric tons carcass weight)	89,094	137,239	137,692
Animal number	19,059,083	29,358,214	25,774,746

Data source: World Bank, based on the Global Livestock Environmental Assessment Model (GLEAM).

**Table C.6.** GHG emissions as absolute emissions and net increase compared to 2019 reference year from cattle and sheep in the Program baseline and productivity scenarios<sup>a</sup>

Year	Baseline scenario		Program	
	Emissions	Increase	Emissions	Increase
(million tons CO <sub>2</sub> eq)				
2019	36.5		36.5	
2020	37.7	1.2	37.1	0.6
2021	38.9	2.4	37.7	1.2
2022	40.2	3.7	38.4	1.9
2023	41.4	4.9	39.0	2.5
2024	42.6	6.1	39.6	3.1
<b>Total</b>	200.7	18.2	191.7	9.2

Data source: World Bank, based on the Global Livestock Environmental Assessment Model (GLEAM).

**Note:** a. Although the Program focuses on beef, this assessment includes an assessment of emissions from cattle and sheep. This conservative approach was retained as (1) for cattle, both the specialized beef herd and the dairy herd contribute to the total beef production, and (2) sheep and cattle are generally browsing on the same grassland and a partition of GHG emissions and C sequestration between the two species would lead to substantial uncertainties.

### 4.3. Grassland Management for Carbon Sequestration

Land management practices carried out to improve net primary productivity of plant cover and increase the flux of organic matter entering the soil (either from plant decay or from manure) will either increase carbon input or reduce carbon losses from the soil. Therefore, improvement in grazing practices, generally based on smaller land management units (e.g., grazing units delineated by mobile electric fences) and adaptive management of the grazing pressure to optimize grass growth will lead to an accumulation of soil carbon. Accumulation will start from the time of adoption and continue for a duration of about 20 years, after which accumulation rates will progressively level off (Guo and Gifford 2002). Avoiding conversion and degradation of native ecosystems is also a strong mitigation alternative. Conversely, restoration of marginal or degraded lands to grassland has a strong potential to increase soil carbon storage (Paustrian et al. 2016).

The modeling of carbon sequestration achieved through the adoption of improved grazing practices resulted in an estimated increase in SOC stocks  $0.6$  (SE.  $\pm 0.3$ )  $\text{t C ha}^{-1} \text{ yr}^{-1}$ , averaged over the whole grassland area of Kazakhstan. These results are in line with global estimates of SOC change reported by Paustrian et al. (2019): average values of  $0.28 \text{ t C ha}^{-1} \text{ yr}^{-1}$  for “improved grazing,” of  $0.47 \text{ t C ha}^{-1} \text{ yr}^{-1}$  for “hayed grassland,” and up to  $3.0 \text{ t C ha}^{-1} \text{ yr}^{-1}$  for adaptive multi-paddock grazing. Estimated soil carbon sequestration achieved under the baseline and Program scenario are presented in Table C.6.

**Table C.6.** Estimated soil carbon sequestration achieved under the baseline and Program scenarios

	Area of grassland in use			Sequestration rates		Carbon sequestration	
	(million ha)			(metric tons C/ha/year)		(million metric tons C)	(million metric tons CO <sub>2</sub> eq)
	Baseline management practices	Improved management practices	Total	Baseline management practices	Good management practices		
2019	57.5	0.5	58			n.a	n.a
2025 - Baseline	61.82	0.5	62.32	0	0.4	1.0	3.7
2025 - Program	58.4	3.2	61.6			4.2	15.5

Source: World Bank.

Note: n.a. = not applicable.

### 4.4. Emission Reduction through the Displacement of Fossil Fuel–Based Energy

The Program will support GoK action toward the development of renewable energies in the agriculture sector. For example, liquid manure and agricultural waste can be fed into biodigesters to generate biogas, which can be used for heating or electricity production. This contributes to GHG emission reduction by providing an alternative to fossil fuel energy and by avoiding methane emissions resulting from the aerobic fermentation of manure. As an example, a large-scale biogas unit currently in activity in Vostok

(Kostanai) currently operates with a capacity of 360 kilowatts and uses 40 metric tons/day of animal manure (cow, sheep, and camel), 1 metric ton/day of slaughterhouse waste, and some crop residues (Karatayev and Clarke 2014). The target for this plant is to deliver 3 Gigawatt hours annually. Other forms of renewables that are promoted include solar panels and wind turbines.

A recent study on climate smart agriculture technologies in Kazakhstan (FAO/EBRD 2017) estimated the current adoption rate to 4 percent and a potential adoption of 10 megawatts in plant capacity, resulting in a potential GHG reduction of 0.04 million tons CO<sub>2</sub>eq / year.

## 5. Conclusions

Table C.7 summarizes the results of this assessment. It shows that the Program can contribute to net mitigation of GHG emissions in Kazakhstan by an estimated amount of 6.4 Mt CO<sub>2</sub>eq over the Program’s duration. More specifically:

1. Adopting productivity increase practices is an effective way to limit GHG emission growth (–50 percent compared to a baseline scenario).
2. Even under conservative assumptions (cf. Table C.4), soil carbon sequestration resulting from the adoption of good grazing management practices can more than entirely offset the GHG emission increase from production growth under the Program.
3. The adoption of energy use efficiency and renewable energy technology can reduce emissions, but only by a very modest proportion.

**Table C.7.** Summary of GHG emission assessment and net GHG emissions under the proposed Program

Year	2021	2022	2023	2024	2025	Total
	(million tons CO <sub>2</sub> eq)					
<b>Program</b>						
Growth in GHG emissions	0.6	1.2	1.8	2.4	3.1	9.2
Carbon sequestration	1.0	2.1	3.1	4.1	5.2	15.5
Fossil fuel displacement	0.01	0.03	0.04	0.05	0.07	0.20
<i>Net emissions under the Program</i>	<i>-0.4</i>	<i>-0.9</i>	<i>-1.3</i>	<i>-1.7</i>	<i>-2.1</i>	<i>-6.4</i>
<b>Program compared to baseline</b>						
Net emissions baseline	1.0	1.9	2.9	3.9	4.8	14.5
Net emissions Program	-0.4	-0.9	-1.3	-1.7	-2.1	-6.4
<i>Net emissions reduction (Program versus baseline)</i>	<i>1.4</i>	<i>2.8</i>	<i>4.2</i>	<i>5.6</i>	<i>7.0</i>	<i>20.9</i>

As part of the M&E plan and using the MRV framework specifically developed to this effect, the Program will support field measurements and process-based modeling to monitor emissions and sequestration throughout implementation and refine these estimates. In the longer term, the data and monitoring system to be used to demonstrate net mitigation of the Program will form the basis for updating the NDC and estimating investments to be targeted for pasture and grassland management.

## Appendix D. Monitoring and Evaluation

This note assesses the Program’s implementing agency’s monitoring and evaluation (M&E) systems, in line with the Bank Guidance Program-for-Results Financing Technical Assessment, which notes that “Functional M&E systems that are responsive to the Program’s requirements are key to demonstrate, measure and where applicable to verify the achievement of results (especially DLIs) and to generate important lessons for learning and improvement” (World Bank 2019, p. 39). The verification of program results is at the core of the Program instrument, and thus ensuring that the data that inform those results are valid, reliable, collected—either as part of existing or supplementary processes—is critical.

The Kazakhstan Ministry of Agriculture’s Livestock Department is the Program’s responsible implementing agency and it will house a Project Management Office, responsible for overall implementation and coordination.

As per the above guidance, this note covers M&E arrangements, capacity, and existing reporting provisions as they relate to the Program needs. The basis for the assessment is a review of project-relevant data and discussions with key informants from relevant agencies and organizations. The M&E capacity of four relevant institutions was assessed with respect to type of data collected, processes for collecting data, reporting, access, data use, organizational accountability, and M&E culture.

Several entities, either linked to or under the Ministry of Agriculture (MoA), will be involved in the implementation of Program components, and therefore will have data collection or at least record-keeping responsibilities. The capacity of the following entities was assessed: the National Agrarian-Science and Education Center (NASEC); the MoA Livestock Department; Veterinary Committee at the MoA, and the Ministry of Environment. Several key informants from additional organizations were interviewed to obtain their perspectives on the above institutions as well.

### **1. Program Areas with Data Requirement**

The data collected for the Program indicators must cover the following areas: farm registration, livestock production, exports, training (farmers and veterinarians), cattle registration systems, development and adoption of new policies, state support measures, public expenditures, veterinary services, greenhouse gas (GHG) emissions, and adoption of good practices. A few other program indicators, such as the Nationally Determined Contribution (NDC), which is an action, are not subject to data monitoring.

For the duration of the Program, these program areas must be monitored, and results must be periodically collected to inform the indicators listed in the *Results Framework Matrix* (see PAD Annex 1). Data sources, methodologies, and responsibilities for data collection are described in the *Monitoring & Evaluation Plan: Intermediate Results Indicators* (also PAD Annex 1). Detailed, precise, and practical descriptions of these procedures will be included in the *Program Operations Manual*.

## 2. Overall Capacity Assessment

The MoA's M&E systems, although strong in selected areas, will need technical assistance to ensure confidence in the tracking and achievement of Program indicators. A review of M&E systems and processes currently in place in implementation agencies identified as strengths: (1) a strong culture of data collection, (2) a wide range of data collected, (3) good record-keeping systems, and (4) good public access to data. However, significant weaknesses exist as well: (1) gaps in data, especially related to number of households raising cattle, weight of cattle in different cohorts, and number of calves currently sold to feedlots; (2) data validity—whether numbers represent what they purport to represent; and (3) data reliability, as illustrated by a wide range of officially reported numbers for beef exports.

State entities regularly compile and publish large amounts of data. Standard and systematic processes are in place for collecting administrative statistics within the system—from state entities under the MoA (e.g., veterinary clinics) and from local authorities. Agency branches at region and oblast level are mandated by law to regularly, usually monthly, report on their services to the ministry. The MoA collects a wide range of administrative data, derived from record keeping of policies and public support implementation. It also conducts surveys to obtain feedback on training courses, but to a limited extent. There is a strong culture of record keeping, and the information system in place seems to be accessible internally. National data on livestock and meat sectors relevant to the program are produced by several state entities: the Statistics Committee, the MoA, Customs, and Sybaga.

A large amount of data on all industrial sectors are publicly available on state websites. The agriculture, forestry, and hunting and fishing sector webpage alone lists approximately 250 variables, which are downloadable and can be used to produce correlations, graphs, and so on. Data are disaggregated by region, year, and period (annual, quarterly, monthly). Most data are published in both Kazakhistani and Russian languages. Data on livestock are included in a statistical yearbook for 2014–2018. Administrative data relating to Program areas appear to be accurate and consistent.

Publicly available data are not necessarily reliable or valid, however. A review of beef export data for 2018, as reported on government websites, in official reports, and by customs, revealed wide discrepancies, which seem at first glance to cast doubts on reporting reliability. However, the differences are largely related to how beef products are classified and defined. Agreement on a common definition of “exports” and an accompanying explanation will help clear-up the confusion and establish a sound baseline.

Data on private sector activities and on the technical, financial, and environmental performance of businesses along the value chains are often not collected. For example, technical and financial parameters are either unavailable or unreliable, and the data required to compute Tier 2 GHG emission inventories in the livestock sector are also missing. There are also concerns that reported data do not always match realities on the ground. For example, it was reported that some registered farms may exist only on paper. This may be due to various reasons: intentional misrepresentation, use of “best guess” estimates, lack of monitoring, low capacity, irregular or nonexistent updating, and so on. It was noted that some registered farms may be active or represented farmland held by an owner but not used. Furthermore, some data are aggregated in ways that make it difficult to use or understand—for example, the combination of “meat” and “poultry” in one category.

The analytical capacity to evaluate monitoring data is limited. It is unclear to what degree the MoA uses data to assess effectiveness and efficiency of government policies or programs. There appears to be little analytical effort carried out at the Department of Livestock and a relatively stronger emphasis on

tabulating and reporting statistics to plainly monitor trends and disbursements. The poor quality of data, combined with contradictory reporting and low accountability (external verification and feedback), has negative implications for results-based programming and results-based budgeting.

### *Strengths*

Data collection processes. Existing capacity for data collection within both the MoA and NASEC appears to be strong. There are standard, systematic processes for collecting administrative statistics within the system—from state entities under the MoA (e.g., veterinary clinics) and from local authorities. Lower-level offices are mandated by law to regularly, usually monthly, report on their services to the ministry. The reports may be in paper or electronic format and are entered into ministry-relevant databases.

Type of data collected. The MoA collects a wide range of administrative data derived from record keeping from registration, inspections, loan applications, subsidy applications and allocation, participation in training, and so on. It also conducts surveys to obtain feedback on training courses, but the use of this method is limited.

Record-keeping systems. There is a strong culture of record keeping, oversight, and control, and the information system in place seems fully operational and effective. When specific information relating to farms, cattle numbers, or live weight was requested, MoA officials were immediately able to access it and could provide breakdowns by region, by oblast level, and even at farm level, if necessary.

Reporting, transparency, and access. A vast amount of data on all industrial sectors are publicly available on government websites, such as <https://stat.gov.kz/>. The agriculture, forestry, hunting and fishing sector webpage alone lists about 250 variables, and these can be downloaded by users. Data is disaggregated by region, year, period (annual, quarterly, monthly) and used to produce correlations and graphs. Data on livestock was published in a statistical yearbook for 2014–18, available online at <https://stat.gov.kz/official/industry/14/publication>. Most data are published in both Kazakhistani and Russian languages.

### *Weaknesses*

Data gaps. If data on policy implementation and areas of the sector under direct control of the MoA are strong, data on private sector activities and the technical, financial, and environmental performance of stakeholders along the chain are often missing. For example: the number of households that raise cattle, the weight of cattle in different cohorts, and the number of calves currently sold to feedlots are either unavailable or unreliable, since administrative data are not collected. In these cases, the values may reflect estimates (made at the local government level) rather than actual conditions. The data required to compute Tier 2 GHG emission inventories in the livestock sector are also missing.

Data validity. There are concerns that, while administrative data may be accurate and comprehensive, they do not always match facts on the ground. For example, it was reported that some registered farms may exist only on paper. It was not suggested that this was due to fraud or misrepresentation, but rather to lack of monitoring whether farms were active or represented farmland held by an owner but not used.

Data reliability: Based on the analysis of beef sector exports, the wide discrepancies raise many questions about data reliability. If this one example is representative, the issue is cause for concern. Since the government is basing its strategy and targets on current output and exports levels, quality control of data

is paramount.

Categorizations. Some data are aggregated in ways that make them difficult to use. Sometimes poultry and beef data are combined, or no distinction is made between live weight of cows from commercial vs. household farms, for example.

Use of data for evaluation. It is unclear to what degree the MoA uses data to assess effectiveness (impact) and efficiency (impact per dollar of public expenditure) of government policies or programs. There appears to be little analytical effort carried out at the Department of Livestock and a relatively stronger emphasis on tabulating and reporting statistics to plainly monitor trends and disbursements.

### **3. Institutional Overview**

#### **3.1. Ministry of Agriculture**

The MoA collects and tracks administrative data on a wide range of livestock and farm indicators. The data are compiled from reports received by local governments (akimats), exporters, and individual farms and agro-businesses, among others, and stored in electronic format. The data is disaggregated by region, type of livestock, year (in many cases going back to 1991), farm type, rural populations and settlements, and so on. Many data are easily accessible by MoA personal via the ministry's intranet. Some data are published at <https://stat.gov.kz/>.

Based on observations, interviews, and analysis of data reports, the MoA Livestock Department rates highly in terms of its capacity to collect, access, share, and understand data. Outside observers speak highly of MoA expertise and competence. It aggregates data from local governments and is the primary reliable source of livestock statistics in Kazakhstan.

Data on a range of areas are collected by a private corporation, Qoldau, at <https://www.qoldau.kz/>, which has over 175,000 platform users (as of January 2020) who apply online. It includes data on subsidies, pasture management, grain receipts, insurance, and so on.

#### **3.2. National Agrarian-Science and Education Center (NASEC)**

NASEC collects two types of data on its training activities—attendance information collected from training participants when they register, and survey data collected after training is completed. Attendance data are collected by the provider, and include name, position, organization and address, contact information, certificate number, and signature. This is kept in paper format and stored at NASEC offices. It is used to count the number of participants, to determine whether the target number of trainees has been reached, and for contacting them. Evaluations are conducted after training sessions via surveys sent to participants asking them to assess the training and state preferences for future training themes. Response rates are said to about 10–15 percent.

NASEC also collects and generates data and analysis through its network of institutes and universities—for example, the Livestock and Fodder Research Institute, the Soil Science Institute, and the Fodder Crops department of the Plant Production Institute, and the Kazakhstan National Agrarian University. Ongoing research projects on plant and animal breeding as well as on the extent, degradation, and potential of

grasslands will generate data, knowledge, and capacities of relevance to the Program. However, none of these projects provides solid, national-level baseline data on beef and lamb supply chains, nor on grasslands.

### **3.3. Sybaga (Agrarian Credit Corporation)**

Sybaga, the government Agrarian Credit Corporation, collects data and makes them available on its website, downloadable in Excel format: <http://sybaga.kz/Home/Index>. The site has data information on livestock farms participating in breeding improvement, breeding cows, registrations with the Information System for Selection and Breeding, pedigree cows, subsidies, and so on. Data are updated daily.

### **3.4. Local authorities (akimats)**

A significant amount of data is collected by local authorities, who are required by law to report administrative data to central ministries on a regular basis. Several key informants indicated that some data submitted from akimats may not be reliable when it comes to the informal sector—for example, household farms—and that estimates rather than accounting methods are used.

For example, when asked about the national average of live weight of cattle at slaughter listed in the national statistics (which was 333 kg in 2018), MoA officials indicated that this indicator should not be taken at face value. Another key informant reported that it was unlikely that any cattle farmer or feedlot would slaughter an animal that weighed less than 380 kg.

Other key informant likewise expressed skepticism over the accuracy of akimat data reported to the central government. Reasons may include incentives to inflate statistics (to show growth), taking shortcuts by making assumptions about changes in rather than collecting data—for example, by increasing the previous year's numbers by a few percentage points.

Use of unverified data from akimats affects the numbers in the national database and is a concern.

### **3.5. Ministry of Ecology, Geology and Natural Resources**

The Zhasyl Damu, an institute contracted under the Ministry of Ecology, Geology and Natural Resources (MEGNR), is responsible for the preparation of National GHG Inventories, including for the livestock. Computation follows a Tier 1 approach (following the IPCC guidelines), essentially multiplying animal numbers from national statistics by fixed GHG emission factors. This simplified way of reporting would not reflect the management improvements supported by the Program at animal, herd, and grassland levels. This would require the development of specific, Tier 2 GHG emission factors. Discussions with MEGNR indicated both a lack of human resources and data currently prevent this shift. Normally, Tier 2 reporting functions would be delegated by MEGNR to line ministries and NASEC.

## **4. Conclusions and M&E Capacity Development Proposed under the Program**

This brief assessment concludes that M&E capacity for compiling Program data appears relatively strong and effective. Capacity and capacity building measures at this level are not deemed necessary. Existing databases can and should be used. However, data collection and entry at the local level is of concern, and

necessary.

To inform some Program indicators, additional procedures and additional data that are warranted will need to be independently collected and authenticated, and new types or data are needed to fill data gaps regarding indicators such as the numbers of farms created and the live weights of cows sold to feedlots. This applies to both the data for establishing a baseline and the data for monitoring Program results to be introduced into the MoA collection and reporting processes.

Because of questions surrounding the reliability and accuracy of data provided to the MoA by local-level entities (at the akimat level), the Program should institute additional data control and verification measures. These measures could involve running surveys and using stratified random sampling to authenticate the data used to inform Program indicators. It may be necessary to outsource the collection of some survey data. The use of surveys as part of training feedback is common practice, but for other purposes—such as checking adoption rates among farmers participating in extension programs—and it may not be customary for the purpose of data verification.

No method is in place to report emissions from the livestock sector on a periodic basis with a level of certainty comparable to international standards. The proposed Program will support the GoK in developing such system, characterized by (1) the technical and institutional arrangements to collect data on emissions and mitigation actions; (2) the documentation of methodologies, assumptions, and data used to estimate emissions; and (3) standardized reporting templates, protocols, and procedures that can be used to verify the accuracy of GHG emission quantifications. The emissions estimates generated through such a system could be used for different purposes, including National Inventory Reports, product branding on international markets and trading of Certified Emissions Reductions on the National Emission Trading Scheme (ETS).

Capacity building and stronger data collection systems will be required to track progress on Program goals and DLIs. It is expected that the GoK will face difficulties with the M&E system at the early stage of the PforR Program implementation. Therefore, the Implementation support team will include a dedicated M&E expert, and the focus of ISM missions will be in supporting the client to develop and implement an effective M&E system. M&E capacity building will focus on data quality, data coverage, and analytical capacity. Because of questions surrounding the reliability and accuracy of data provided to the MoA by local-level entities (at the akimat level), the Program will institute additional data control and verification measures. These measures will involve running surveys and using stratified random sampling to authenticate the data used to inform Program indicators. Specific data collection at the start of the program for benchmark indicators—to ensure the high quality of data used for DLIs and to fill in missing values—will be outsourced. This will involve (1) a limited data quality review exercise (covering both data collection systems and data quality and reliability), leading to (2) recommendations for strengthening data collection for relevant DLIs, (3) training of MoA/Program management office (PMO) M&E staff in assessing data quality and improving data collection, and (4) implementation of the improved system for the selected indicators. The Program will also support capacity development at the central level (e.g., in the area of sampling and survey design, statistical analysis, evaluation, and reporting).

## **5. Implementation Arrangements**

Under the Program, the PMO under the Vice Minister of Agriculture will be responsible for coordination and M&E. All agencies engaged under the Program (the Agrarian Credit Corporation, or ACC, Sybaga, NASEC, Veterinary Committee) will be responsible for collecting data related to the indicators for their

respective results areas. They will submit data to the MoA M&E unit, which will review data for quality and validity and make them available to the independent verification agency. Databases will be stored by the MoA IT department. The World Bank will provide technical assistance for building the capacity of the PMO M&E unit, for managing the reporting processes, and for ensuring data quality and reliability.

The Program will develop a monitoring reporting system to track net GHG emissions in the livestock sector. The Program will support the GoK in developing such system, characterized by (1) the technical and institutional arrangements to collect data on emissions and mitigation actions; (2) documentation of methodologies, assumptions, and data used to estimate emissions; and (3) standardized reporting templates, protocols, and procedures that can be used to verify the accuracy of GHG emissions quantifications. This capacity will be developed within NASEC, where most detailed knowledge on livestock production systems is available.

## Appendix E. Economic Analysis

The Program aims to stimulate the creation of new commercially oriented farms, feedlots, and meat processing plants to raise beef production in order to increase GDP, rural employment, and exports. The economic analysis considers the potential program benefits flowing to cattle farms and feedlots at both the individual and national level. The analysis takes into account: (1) the current structure of the sector; (2) recent historical growth rates (cattle, meat production, feedlots, etc.); and (3) the targets and assumptions as defined in the Program (see Program’s result framework and Appendix A of this assessment).

### 1. Rationale for Public Provision and Financing

Public financing of this Program has three main justifications: (1) the provision of public goods, such as equipment and infrastructures for grassland management, information systems, and export infrastructure that are essential to increase production, foster participation of individual and household farms, and reduce environment impacts; (2) enhancing core public sector functions can be done by strengthening the institutional framework, for example in terms of veterinary services, animal identification and recording systems, administration of public support to the livestock sector, M&E, and private sector involvement and promotion; and (3) critical services to the meat value chains, such as extension and technology transfers, export certificates, and research and knowledge generation, must be provided through the national agricultural research system.

### 2. Farm Structure

Kazakhstan has approximately 1.9 million production units, which are divided into three categories: household farms, individual farms, and agricultural enterprises (Table E.1). The great majority, 1.64 million, are household farms and operate in the informal sector. The remaining 15 percent, totaling 252.6 thousand are registered active farms. They comprise large agricultural enterprises or individual farms (registered either as individual farmers or individual entrepreneurs but considered as a single category by the Program). Less than one-quarter of individual farmers are women, and 14.7 percent of agricultural enterprises are run by women.

**Table E.1.** Farm structure of Kazakhstan

	Household Farms	Individual Farms		Agricultural Enterprises
		Individual Farmers	Individual Entrepreneurs	
Number of active entities	1,638,561	236,852	26,918	13,937
...of which women-owned (N)	—	51,685	—	2,050
...of which women-owned (%)	—	24.6%	—	14.7%
<b>Total farms</b>	<b>1,891,156</b>			

Source: Statistic Committee, as of January 1, 2020, [www.stat.gov.kz/](http://www.stat.gov.kz/) / Официальная статистика/По отраслям/Статистика предприятий.

Note: — = not available.

Household farms own over half the nation’s cattle for milk and beef production (Table E.2). However, households own just two or three cows on average, and 85 percent are dual-purpose cattle, used mainly to produce milk (male calves are fattened and then slaughtered for meat, together with cows at the end of their milk production cycle). It is assumed that few households currently sell their calves to feedlots, and that most slaughter informally at the farm or sell them to the market or local slaughterhouses.<sup>6</sup> Households represent one potential source of investors in new individual farms, and it is assumed that a certain number will register, scale up operations, and link more consistently to the commercial value chain.

Of the 236,852 existing individual farms,<sup>7</sup> only a minority (approximately 15 percent) raise any cattle at all.<sup>8</sup> Approximately 20,000 of these farms reportedly raise specialized beef cattle. Out of the 2.4 million head of cattle on individual farms, 52.3 percent are beef cattle. Individual farms raising dual-purpose or dairy cattle, other livestock, or crops are currently not involved in raising beef cattle but represent another potential source for increased meat production.

**Table E.2.** Cattle (beef and dairy) ownership by farm type

	Households		Individual farms		Agro-enterprises		Total	
<b>Cattle</b>	4,024,065		2,400,994		712,869		7,137,928	
<b>Share of cattle</b>	56%		34%		10%		100%	
<b>Breed</b>								
Dairy and dual-purpose breeds	3,396,745	84.4%	1,144,961	47.7%	254,538	35.7%	4,796,244	67.2%
Beef breeds	627,320	15.6%	1,256,033	52.3%	458,331	64.3%	2,341,684	32.8%

Data source: Asian Development Bank, based on MoA data, 2019.

Agro-enterprises, although numbering relatively few both in terms of absolute number of farms and in terms of the number of cattle (10 percent of the total), are more likely than the other two farm categories to raise beef cattle (64.3 percent).

Cattle feedlots have been used in Kazakhstan only since 2012. The 85 that currently operate have a total capacity of 225,000 (animal slots), which can process 450,000 cattle per year, assuming two cycles. In 2019, 232,000 head were processed—that is, feedlots operated, on average, at just over 50 percent capacity. This was a significant increase over 2018, when 166,821 head of cattle were sold to feedlots.<sup>9</sup> It is assumed that the remaining farms that raise beef cattle either slaughter informally at the farm or sell to the market or local slaughterhouses.

<sup>6</sup> According to the Meat Union, perhaps 5 percent of animals purchased by feedlots come from household farms.

<sup>7</sup> These are also referred to as *peasant farms* or *family farms*.

<sup>8</sup> Cattle statistics are from <http://stat.gov.kz/api/getFile/?docId=ESTAT328542>.

<sup>9</sup> A breakdown of the number of farmers selling to feedlots is not available.

## 2.1 Individual Farms

The focus of the government’s farmer-centric approach is small and medium farmers. They comprise individual farms (which are, by definition, registered) and household farms (which are not registered). One of the Program’s ambitions is to support the transition of part of these farmers toward higher levels of efficiency and a formal connection to the beef value chains by marketing calves to feedlots.

Most individual farms and agricultural enterprises in the beef sector are cow-calf operations. A standard cow-calf operation is assumed to be selling approximately 35 to 40 percent of the herd every year (for slaughter or further fattening).<sup>10</sup> The remaining cattle are kept or sold for replacement or breeding. Table E.3 provides a breakdown of the number of farms and cattle (beef and dairy) head per size of farms. The average individual cow-calf operation has 50 head, with 61 percent of farms owning at between 10 and 100 head.

**Table E.3.** Individual farms raising cattle (beef and dairy)

<i>Individual farms</i>	<b>Farms (N)</b>	<b>Share of farms</b>	<b>Head of cattle (N)</b>	<b>Share of head</b>	<b>Avg. number of head per farm (N)</b>
up to 10 head	6,650	20%	41,182	2%	6
11–50 head	13,847	41%	387,533	16%	28
51–100 head	6,651	20%	503,315	21%	76
101–500 head	6,011	18%	1,155,151	48%	192
more than 500 head	302	1%	322,553	13%	1,068
<b>Total</b>	<b>33,461</b>	<b>100%</b>	<b>2,409,734</b>	<b>100%</b>	<b>72</b>

Source: World Bank calculations based on MOA data.

Other types of farms include breeding farms. These farms sell pedigree cows to cow-calf operations, and they benefit from significant government support for each pedigree cow imported. Farms also receive support for participating in the cattle improvement program. Approximately 2,300 farms received this type of support in 2019. It is not known whether there are farms operating as “stocker operations”—that is, farms with few or no breeding cows earning revenue by grazing and fattening cattle purchased from other farms.

## 3. Export Markets and Competitiveness of Kazakhstani Beef

Kazakhstan is focused on expanding its beef exports to stimulate cattle farm activity, processing capacity, rural employment creation, and export revenue. Beef meat exports were negligible through 2017, but a significant increase in exports was reported in 2018, when 19,427 tons of beef were exported, followed by 41,193 tons in 2019.<sup>11</sup> (The wide disparity in the amount of beef exports raises questions over both

<sup>10</sup> This assumption is based on 70 to 80 percent fertility rates.

<sup>11</sup> According to Veterinary Committee of the MOA data. Data on beef exports vary widely, based on the source and how exports are calculated. Thus, trade statistics based on customs data give a much lower figure, since they exclude live animals for slaughter.

monitoring and achieving its targets, a subject discussed in the M&E capacity assessment of this document). Table E.4 reports the main meat products currently exported from Kazakhstan.

**Table E.4.** Main meat products currently being exported from Kazakhstan

Live animals	Fresh meat	Frozen meat
<p>Export of livestock products is considered highly profitable now. To facilitate this trade with China, the Government of Kazakhstan entered into agreement with the Government of China in May 2018 to build a large livestock logistics center for 240,000 head of cattle in Alashankou, China, across the border from Kazakhstan. The project was launched in April 2019 by Chinese CITIC construction company, with the logistical center being managed by Chinese company Beijing Capital Farm Group. Kazakhstan is currently improving the road from Usharal-Dostyk (a border point with China), while the Ministry of Agriculture recently signed the sanitary and phytosanitary (SPS) agreement on export of cattle/beef, pigs/pork, and sheep/lamb from Kazakhstan to China to facilitate trade in this direction. In addition, Kazakhstan is investing in the livestock quarantine center near Aktau port on the Caspian Sea for the export of live animals to the Islamic Republic of Iran, Turkey, and other countries, which will significantly ease trade and open access to new markets.</p>	<p>Export of fresh high-value meat has increased and is being shipped at a cost of 0.70 US cents per 1 kilogram of meat by Air Astana. Since this is high-value meat it is cost-effective to ship it by air. Most fresh beef currently goes to the Middle East (meeting halal requirements), but with the increased availability of high-quality meat on the market it will be also shipped to China and other countries. As soon as increased availability of high-quality meat on the market is available and restrictions imposed by China on Kazakhstan disallowing export of fresh meat are removed, Air Astana has a capacity to export up to 2.5 tons per day of fresh meat to Beijing for US\$1 per 1 kilogram.</p>	<p>At present, only frozen high-quality meat from Kazakhstan is allowed for export to China. Export of frozen beef is relatively small at this point, because of the low volumes of beef surplus and allegedly high railway freight costs (compared with sea freight tariffs). When meat export is a one-time transaction, it is expensive. When meat processors reach the level of asking transport services providers to use five to six refrigerators monthly, the cost would reduce. As a result, both issues are resolvable once there is an increase in meat exports, development of the large clients on the market, and less expensive routes found to export to China. There is also a growing volume of refrigerators, both in trucks and rail wagons, available for operations.</p>

Source: World Bank.

An International Finance Corporation (IFC) value chain analysis from 2017 assessing the costs of production of the Kazakhstan beef sector found that the industry can be competitive in the long run. This analysis is based on an assessment of industry fundamentals, weighing the country's advantages and disadvantages against each other, and comparing costs of production in Kazakhstan with costs in other beef-exporting countries.

The IFC also noted that building a new much-needed genetic base will take time and that the country needs to build a critical mass with beef-bred cattle and access to good export markets. Key informants interviewed as part of the present analysis concurred with this assessment, while also noting that demand abroad for beef from Kazakhstan is robust, with the main impediment being the ability of exporters to provide a regular supply.

The value chain analysis found that breakeven cost of production compares favorably to global carcass benchmarks; there is potential for sustainable profitability across all supply chain participants; and there is sectoral resilience to market volatility and trade disruptions. It estimated that cow-calf operations on a US\$/kilogram basis were lower in Kazakhstan than in all other large beef-producing or exporting countries (Argentina, Australia, Brazil, Canada, the United States, Ukraine, Russia, and China) and that feedlot operations were also lower cost relative to these countries, second only to Ukraine. It further found that derived beef prices for Kazakhstan (US\$5.1) were behind only those of Russia and Brazil. However, customs data from 2018 indicate that the price of beef exports from Kazakhstan was 3.73 US\$/kilogram for fresh or chilled meat (World Bank 2018),<sup>12</sup> and US\$/kilogram 6.77 for frozen. The price for fresh or chilled meat was cheaper than all comparable exporting countries except India.

The greatest realistic export opportunities for Kazakhstan at present are the growing export markets of China (at US\$2.6 billion worth of beef imports) and the Middle East (US\$1.8 billion), and Russia's contracting export market (US\$1.3 billion). The IFC analysis finds that Kazakhstan would not be competitive with Brazil in the Chinese market at current Kazakhstan domestic prices, but that costs in Kazakhstan are low enough to withstand any margin tightening likely to accompany stronger export orientation. It estimates that Kazakhstan could potentially compete in the high-quality beef segment of the market if it achieves preferential market access.

The effectiveness of the transport and logistics sector in Kazakhstan may be a potential barrier to the projected high volume of meat and livestock exports. Among key barriers are high costs, limited number of private service providers, inefficient transport and logistics infrastructure, poor quality of available services, and lack of knowledge of modern logistics and supply chain management. Nevertheless, based on discussions with Kazakhstani logistics companies involved exporting, as well as with companies producing and processing meat,<sup>13</sup> it appears that the transport and logistics sector in Kazakhstan can respond to increased demand by increasing meat and livestock exports. For example, currently only five of Kazakhstan's meat producing and processing companies have clearance by Chinese food safety authorities to export meat to China; four additional companies will soon be able to do so as well. Logistics companies report readiness to expand their capacities and improve service provision as the demand for their services picks up.

In recent years, the Government of Kazakhstan has invested about US\$40 billion in the transport and logistics sector through the Nurly-Zhol program, with the objective of making Kazakhstan a transport and logistics hub—an overland route between China and Europe. Among some of the priorities for the extension of the Nurly-Zhol state infrastructure development program after 2020 are the development of an efficient transit, export, and logistics infrastructure,<sup>14</sup> as well as improved rating in the Logistics

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<sup>12</sup> This is calculated as the export value of beef meat (fresh and frozen) (HS codes 0201 and 0202) in current US dollars divided over the net weight in kilograms.

<sup>13</sup> Authors' discussions in 2019 with Maksut Baktibayev, Meat Union, General Director; Daniyar Zhumashov, KazAgro, Managing Director & Asylkhan Djuvashev, Managing Director; Shyngys Jaxybekov, TKZ Express, Sales Director, Railway transportation; Erlan Absatov, KazLogistics, General Director; Zhanna Shayakhmetova (over phone); AirAstana, Cargo transportation manager.

<sup>14</sup> For details, see <https://zonakz.net/2019/09/11/pochti-t9-trln-planiruyut-potratit-na-realizaciyu-gosprogrammy-nurly-zhol-v-2020-2025-gody/> see <https://zonakz.net/2019/09/11/pochti-t9-trln-planiruyut-potratit-na-realizaciyu-gosprogrammy-nurly-zhol-v-2020-2025-gody/>.

Performance Index (LPI) from its current value of 77 to 49.<sup>15</sup> At the same time, increased private sector participation in the sector and streamlined cross-border clearance procedures (otherwise causing substantial trade delays and serving as trade barriers) would increasingly provide a conducive environment for export increases. The private sector efficiently responds to opening export markets and increasing demand for meat, and improved logistics infrastructure will support this response.

## **4. Economic Evaluation**

### **4.1. Expected Benefits**

It is expected that the benefits of the Program will come from the following improvements:

#### *Farm-level productivity*

- Calves reaching live weight for slaughter in shorter period of time, as a result of better pasture management and veterinary services;
- Higher offtake percentage as a result of increased fertility, lower disease incidence and higher daily weight gains;
- Improvement in the quality of beef cattle through import of pedigree cattle and better breeding strategies and management;
- Lower feed costs stemming from more efficient production in terms of heads per hectare of pasture and feed conversion ratio; and
- Increase in revenue and profits as existing cattle farmers increase their herd size.

#### *Feedlot supply*

- Greater availability of reliable supply of animals; and
- Higher quality animals, ensuring better feed conversion ratios.

#### *Export value chain level*

- Lower transaction costs related to the export of beef, as facilitated by better data management systems and faster delivery of export certificates; and
- Economies of scale along the value chain as a higher number of calves enter the export-oriented supply chains.

#### *Reduction of GHG emissions*

- The project will result in reduced GHG emissions, thereby contributing to reducing the economic burden of climate change.

Details of the economic evaluation estimates are presented in Table E.5.

### **4.2. Farm-Level Analysis**

A comparative analysis of profitability of the livestock sector (and other sectors) in Kazakhstan found that cattle had the lowest rate of profitability, at 8.06 percent—the same as pigs, and well below milk (29.5

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<sup>15</sup> See <https://zonakz.net/2019/09/11/pochti-t9-trln-planiruyut-potratis-na-realizaciyu-gosprogrammy-nurly-zhol-v-2020-2025-gody/>.

percent), wool (21.46 percent), sheep and goats (17.04 percent), and eggs (13.16 percent). There was significant variation by oblast, with Almaty oblast having the higher beef productivity ratio at 31.4 percent. Fodder is expensive compared to pasturing, and the shorter winters in the south explains this higher profitability.

The government's National Livestock Strategy includes an economic evaluation of a reference cow-calf operation with 50 breeding cows, establishing that investments in new farm of this size are profitable, when benefiting from credits and support. This is based on yield assumptions of 80 percent, annual sales of 15 yearling heifers (at US\$1,067 per head), 20 weaned bulls (at US\$467 per head), and 5 culled cows (at US\$800 per head). It assumes annual revenues of US\$29,333 and profits of US\$12,453, which works out to US\$311 per cow sold. These assessments may not reflect the average current operation, but with Program support, well-targeted productivity-focused support measures, should be achievable.

Assumptions include funding of almost US\$100,000, met through credits for acquiring property from the local executive body (agency agreement with the agricultural financial support fund, etc.); for establishing irrigated pastures (financing their equipment/construction) and buying calves from a KazAgro loan; plus resources of the employment program; and KazAgro loans/leasing to purchase a tractor, hay baler, rake, hay compactor, and cattle feed.

Looking at larger operations, calculations for an IFC study estimated net income (profit) of US\$72,234 for a breeding 200 cow-calf operation farm, assuming improved farm management practices and better breeds.<sup>16</sup>

While these figures will vary by cow-calf farm operator and by region (farms in the south will be able to rely more on pastures and less on feed, given shorter winters), the MoA considers US\$12,453 to reflect the average for a new farm with 50 cows. This takes into consideration that farmer competence, management skills, and use of techniques for maximizing productivity will increase the chances of a new farm being profitable.

### **4.3. Sector-Level Analysis**

The analysis considers potential benefits flowing to individual cattle farms, both existing and new, and to feedlots. It aggregates these benefits at the national level in financial terms and for two timeframes: 5 and 10 years.

The model uses Program targets for production increases and creation of new cow-calf and feedlot operations. It also relies on the technical improvement assumptions as described in Appendix A of this technical assessment.

The analysis does not factor in the role played by support measures but assumes that, as these measures evolve into more productivity-focused incentives, as per the Program goals, they will stimulate and not constrain production.

Government support payments to the sector must be subtracted from gains to arrive at net benefits. Estimated headage payments and matching grants to the cattle sector of 125.5 billion Kazakhstani tenge

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<sup>16</sup>These assumptions are based on IFC 2019, February 7, p. 7.

(US\$331.7 million) are factored in. Together, these payments amount to 3.32 billion over 10 years. The annual amount is held constant over time, but it is assumed that they will shift from production to productivity-oriented and underpin the increase in new cattle farm creation, farm profits, and exports.

The economic analysis incorporates the following elements: (1) production at newly established cow-calf farms; (2) production at existing cow-calf farms; (3) feedlot production and profits; and (4) subsidies (as a cost).

#### *New individual farms*

Over the four years of the Program, the benefit from increasing cattle production will be in the form of *new farms raising cattle*. The Program assumes a goal of creating 20,000 new cow-calf operations, with an average of 50 breeding cows, and selling 40 head—half to feedlots and half as heifers for breeding. It should be noted that even the estimate of 20,000 new farms, while highly ambitious, is below the government's livestock targets of 40,000 new farms between 2021 and 2025.

The model assumes that a new farm will have zero profits in its first two years, as the farms establish themselves and require time for breeding cows to produce offspring and for them to grow to their live weight target, take time to produce. After this period, profit per farm is estimated at US\$12,453. This translates into a net profit of US\$311 per cow sold. In 2018, average live weight of cattle at slaughter is estimated at 333 kilograms for all cattle, with an average of 411 kilograms for cattle at agricultural enterprises.

Adjustments to aggregate profits include: a time lag before production of animals for sale reaches 80 percent of breeding cows (half of which are sold to feedlots). We assume that new farms will sell 15 cows to feedlots per year.

#### *Existing individual and household farms*

Another benefit flow is in the form of profits flowing to *existing cattle farms* already operating that increase productivity, resulting in heavier live weight of animals. Benefits from the Program to farms are in the form higher feed conversion ratios due to lower disease incidence, fewer cow deaths, and more rapid weight gain. The average farm sold 17 head of cattle to feedlots in 2018. We assume this will rise by more than 50 percent, to 29 head, over the course of the Program. We assume that existing farms will increase their sale of animals to feedlots at a rate of 5 percent per year.

We assume that out of 100,000 farms trained under the Program in good practices, half will be individual farms (with and without cattle) and half will be household farms. Expected good practice adoption rates are high (80 percent) for new farms, and 40 percent for existing farms, as they will be less likely to abandon the practices that they are comfortable with. We assume an adoption rate of 25 percent for household farms, since they are presumed to be less commercially oriented, have far fewer cattle, and thus have less of an incentive to adopt (see Appendix A of this technical assessment).

We estimate the initial annual financial benefit to individual farms from adopting at US\$1,804, which represents a 20 percent increase in revenue (based on profits for US\$12,453). For household farms we estimate an annual financial benefit of US\$200, based on a 20 percent increase for the sale of four cows at US\$250. We assume a lag of two years between adopting good practices and financial impact.

### *Feedlots*

Benefits from the Program to the feedlots are in the form of an increased and steady supply of animals. Under this model we do not consider the number of feedlots created, but instead focus on total capacity in terms of animals sold to feedlots. This number is based on the growth in farm numbers and productivity and the genetic quality of animals entering the feedlots. Most existing feedlots are small, and whether new feedlots are created, or existing ones expand their capacity, does not materially affect the analysis.

Feedlot profits per animal are estimated at US\$147, derived from government calculations of feedlot profitability, assuming average weight is 250 kilograms when sold to the feedlot and the increase in weight as a result of fattening is 250 kilograms, reaching 500 kilograms in total before being sold to meat processing plants. The total capacity of feedlots is projected to rise from current level of 450,000 animals to 1.31 million, and they are expected to buy and fatten 1.04 million animals, while operating at 80 percent capacity. We assume that not all new farms will sell to feedlots, and that there will be a lag of two years following the creation of new farms and when they start selling to feedlots.

### *Net reductions of GHG emissions*

For GHG emissions, the model assumes that the volume of emissions reduced over the duration of the Program is equivalent to 6.4 million tons and 17.1 million tons CO<sub>2</sub>eq, over 5 and 10 years, respectively. Using the shadow cost of carbon of US\$40 per ton of CO<sub>2</sub>eq, starting in 2020 and rising to US\$50 per Mt CO<sub>2</sub>eq in 2030, the total net benefits from avoided emissions come to US\$279.3 million over the 5 years of the program, and a PV of US\$791.0 million over 10 years.

**Table E.5. Analysis of economic benefits**

	Units	2019 (actual)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	cumulative
<b>Farm level</b>													
<i>New farms</i>													
New cattle farms created	farms	851	2,000	3,000	4,000	5,000	6,000	0	0	0	0	0	
New farms created (cumulative)	farms	851	2,000	5,000	9,000	14,000	20,000	20,000	20,000	20,000	20,000	20,000	
Per-farm profits	USD		12,453	13,076	13,729	14,416	15,137	15,894	16,688	17,523	18,399	19,319	
Total profits - all farms	USD				27,458,865	72,079,521	136,230,294	222,509,480	333,764,220	350,452,431	367,975,053	386,373,805	<b>1,896,843,670</b>
<i>Existing farms (individual)</i>													
Cattle - total	animals	1,360,972	1,374,582	1,388,328	1,402,211	1,416,233	1,430,395	1,444,699	1,459,146	1,473,738	1,488,475	1,503,360	
Cattle sold for slaughter	animals	449,121	453,612	458,148	462,730	467,357	472,119	476,751	481,518	486,333	491,197	496,109	
Profit per animal	USD		250	258	265	273	281	290	299	307	317	326	
Total profits	USD		113,402,992	117,973,132	122,727,450	127,673,366	129,744,184	133,171,192	137,739,491	142,532,193	147,558,340	152,827,341	<b>1,351,349,682</b>
<i>Adopting good practices</i>													
Receive training - total	farmers		14,000	17,000	21,000	26,000	32,000	16,000	16,000	16,000	16,000	16,000	
...of which new individual cattle farms (80%)	farmers		2,000	5,000	9,000	14,000	20,000	4,000	4,000	4,000	4,000	4,000	
...of which existing individual cattle farms (40%)	farmers		2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	
...of which existing household cattle farms (25%)	farmers		10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	
Individual farms adopting	farmers			4,800	8,000	12,000	16,800	4,000	4,000	4,000	4,000	4,000	
Household farms adopting	farmers			2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	
Individual farms adopting - cumulative	farmers			4,800	12,800	24,800	41,600	45,600	45,600	45,600	45,600	45,600	
Household farms adopting - cumulative	farmers			2,500	5,000	7,500	10,000	12,500	12,500	12,500	12,500	12,500	
Individual farms adopting - change in profits (29 cows)	farmers			1,082	1,100	1,150	1,200	1,250	1,300	1,350	1,400	1,450	
Household farms adopting - change in profits (7 cows)	farmers			200	200	200	200	200	200	200	200	200	
Total change in farm profits - individual farm	farmers			5,191,200	14,080,000	28,520,000	49,920,000	57,000,000	59,280,000	61,560,000	63,840,000	66,120,000	
Total change in farm profits - household farm	farmers			500,000	1,000,000	1,500,000	2,000,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	
Change in farm profits by adopters (20% more)	USD			5,691,200	15,080,000	30,020,000	51,920,000	59,500,000	61,780,000	64,060,000	66,340,000	68,620,000	<b>423,011,200</b>
<b>Feedlot level</b>													
Animals sold to feedlots (from new farms)	animals		0	0	130,500	203,000	290,000	290,000	290,000	290,000	290,000	290,000	
Animals sold to feedlots (existing + new farms)	animals	232,000	453,612	458,148	593,230	670,357	719,119	766,751	771,518	776,333	781,197	786,109	
Revenue per animal sold	USD		500	500	500	500	500	500	500	500	500	500	
Profit per animal sold	USD		147	154	162	170	179	188	197	207	217	228	
Feedlot profits	USD		66,680,959	70,715,157	96,143,233	114,075,214	128,491,689	143,852,705	151,984,511	160,579,727	169,664,961	179,268,360	<b>1,281,456,515</b>
<b>Exports</b>													
Exports (tons carcass weight)	tons		42000	52,920	66,679	84,016	105,860	133,383	146,722	161,394	177,533	195,287	214,815
Value of exports (fresh, frozen, at USD 3000/ton)	USD	126,000,000	158,760,000	200,037,600	252,047,376	317,579,694	400,150,414	440,165,456	484,182,001	532,600,201	585,860,221	644,446,243	<b>4,015,829,207</b>
Profit (at slaughterhouse and export company level), estimated at 20%	USD	25,200,000	31,752,000	40,007,520	50,409,475	63,515,939	80,030,083	88,033,091	96,836,400	106,520,040	117,172,044	128,889,249	<b>803,165,841</b>
<b>Gross benefits</b>													
	USD		211,835,951	234,387,010	311,819,023	407,364,039	517,416,250	652,066,468	788,104,622	831,144,391	876,710,398	924,978,755	<b>5,755,826,908</b>
<b>Subsidies to livestock and beef production</b>													
	USD		331,700,000	331,700,000	331,700,000	331,700,000	331,700,000	331,700,000	331,700,000	331,700,000	331,700,000	331,700,000	<b>3,317,000,000</b>
<b>Net benefits (gross benefits minus subsidies)</b>													
	USD		(119,864,049)	(97,312,990)	(19,880,977)	75,664,039	185,716,250	320,366,468	456,404,622	499,444,391	545,010,398	593,278,755	<b>2,438,826,908</b>
<b>Greenhouse gases (GHG)</b>													
Volume of emission reduction generated by the Program	Mt CO2eq		-0.43	-0.85	-1.28	-1.71	-2.13	-2.13	-2.13	-2.13	-2.13	-2.13	
Shadow cost of Carbon (low value option for 2020, and assuming constant over time)	USD per t CO2eq			42	43	44	45	46	47	48	49	50	
Economic benefit from avoided emission	USD		17,484,222	35,821,333	55,011,333	75,054,222	95,950,000	98,082,222	100,214,444	102,346,667	104,478,889	106,611,111	<b>791,054,444</b>
<b>Net economic benefit including GHG emission reduction</b>													
			(102,379,827)	(61,491,657)	35,130,356	150,718,262	281,666,250	418,448,691	556,619,067	601,791,058	649,489,287	699,889,866	<b>3,229,881,353</b>
<b>Net Present Value</b>													
5 yrs - without CC benefits	NPV (12%)		(\$45,283,426)										
10 yrs - without CC benefits	NPV (12%)		\$912,751,777										
5 yrs - with CC benefits	NPV (12%)		\$140,182,936										
10 yrs - with CC benefits	NPV (12%)		\$1,306,579,732										

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