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ROYAL GOVERNMENT OF BHUTAN
Ministry of Agriculture & Livestock
Department of Livestock
NATIONAL DAIRY DEVELOPMENT CENTRE
YUSIPANG, THIMPHU

DoL

No: NDDC/Tech 27/2024-2025/10 Thursday, July 3, 2025

The Hon'ble Director
Department of Livestock
MoAL, Thimphu

Subject: **Submission of Annual Centre Report FY 2024-2025 of NDDC Yusipang**

Respected Dasho,

Please find attached herewith the **Annual Centre Report for the** FY 2024-2025 of NDDC Yusipang.

Submitted for Dasho's kind information and continued guidance please.

Yours Faithfully,

Dr Dorji
Offtg. Specialist Head

Copy to:
1. The Chief, LPD, DoL, Thimphu for information and continued support.
2. The Sector heads, NDDC, Yusipang for information and record.

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NATIONAL DAIRY DEVELOPMENT CENTRE
DEPARTMENT OF LIVESTOCK
MINISTRY OF AGRICULTURE & LIVESTOCK
YUSIPANG, THIMPHU

ANNUAL CENTRE REPORT

2024 -2025

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From the Program Director's Desk

This is the 9th Annual Centre Report of NDDC Yusipang, published to highlight progress made by the National Dairy Development Centre during the fiscal year (FY) 2024-25.

In line with its mandate to produce and supply quality Artificial Insemination (AI) inputs, the Centre produced 21,425 doses of frozen bovine semen and 50,687 litres of liquid nitrogen (LN_2). Additionally, 17,153 doses of progeny-tested and genomically selected semen of exotic breeds were imported. Following the structural reform in January 2023 and the closure of RLDCs, NDDC took over scheduled distribution of AI inputs and LN_2 to 14 Dzongkhags across three regions.

Skills development remained a key focus, with 69 Community AI Technicians (CAITs) trained across five Dzongkhags. A two-week refresher training was also provided to six AI technicians in Bumthang to enhance service delivery. Currently, 130 AI centers are operational nationwide. During the FY, 7,559 AIs were performed, resulting in 3,232 progenies (1,014 males and 2,218 females), with a national AI success rate (AISR) of 42.8%.

The use of sexed semen, promoted since 2019, expanded to 76 AI centers across all 20 Dzongkhags. A total of 2,596 AIs using sexed semen produced 1,140 progenies, with an 88.9% female birth rate—within the recommended 80–90% range.

To accelerate herd improvement, the Elite Heifer Breeding Scheme (EHBS) was initiated to promote scientific breeding and performance recording. The program aims to establish elite breeding hubs in various Dzongkhags to supply good quality heifers.

The Centre also advanced quality assurance in milk through the Quality-Based Milk Grading System (QBGS). Research on milk quality assessment and payment system reform is ongoing. During the year, 1,010 milk samples were tested for composition and 1,077 for microbial load. Additionally, 69 farmers were trained in clean milk production and 41 in product diversification.

To promote climate-smart dairy practices, the Centre facilitated stakeholder consultations across all 20 Dzongkhags, piloted Sistema.Bio digesters in the east, supported biogas revival in Wangkha, and trained livestock staff on an online registration system for biogas installations.

In knowledge management, the Centre published the Annual Report, a Package of Good Practices, and four scientific research papers. Real-time data capturing through the National Dairy Information System (NDIS) continued, with 17,364 cattle registered in 19 Dzongkhags (excluding Gasa) and 3,419 AI reports generated. Enhancement of NDIS was carried out to upgrade the system and incorporate Yak information. Online consolidated reporting of Dairy Farmers' Group (DFG) products further strengthened data accuracy for informed planning and monitoring.

NDDC continues to embrace innovation and transformative strategies to build a modern, climate-resilient dairy sector equipped to meet the challenges of the 21st century.

Tashi Delek!

Dr. Dorji

Offtg. Program Director

Executive Summary

During the FY 2024-2025, the Centre as mandated produced 50,687 litres of Liquid Nitrogen (LN_2) of which 36,932 litres was distributed to 14 Dzongkhags under West, West Central and East central regions. A total of 9,361 litres was used for semen bank refilling, 3,271 litres for semen processing and freezing, and 1,991 litres was evaporation losses, leading to 50,221 litres of LN_2 utilized during the FY. Similarly, a total of 21,425 doses of quality Pedigree selected bovine semen from cattle breeds (Jersey, Nublang, Mithun, Holstein Friesian and Brown Swiss) was produced in country and 4,565 doses distributed in the field. Additionally, 17,153 doses of Progeny Tested / Genomic Selected Bovine Semen were imported with 12,153 doses of Sex sorted (5,250 RLDC Kanglung, 247 DLS Bumthang, 1093 DLS Trongsa, 1109 DLS Tsirang, 4,544 NDDC) and 5,000 doses conventional bovine semen. At the end of the FY a total 226,910 doses of pedigree selected semen produced in the country is available in the centre as closing balance.

Based on Royal Command the centre in collaboration with relevant stakeholders, research trials on Inter-species Hybridization of WAGYU (Bos taurus) & YAK (Poephagus grunniens) is being continued to explore cross breeding between Yak and Wagyu cattle.

The Farm Unit at the centre has a total of 34 animals, including 18 elite semen donor bulls of various breeds and 16 ET donor animals (11Thrabam and 5 Jersey crossbred). For year round feeding of donor bulls and ET cows, fodder development and conservation is critical for which 10 acres of existing pasture was renovated, 0.133 acre of improved temperate pasture was established, 1.5 acres of fodder maize was cultivated and 192 MT of silage and 20 MT hay was conserved as winter fodder. Further 8 acres of existing pasture field has been irrigated through surface irrigation and FYM compost applied to 45 acres of existing pasture field. Additionally, 60 MT of maize silage and 30 MT of improved hay was conserved at the Royal Soelbum Herd at Ramtokto and Royal Chipta Farm at Taba along with 3 acres of winter oats for the Royal Soelbum Herd was cultivated to supplement green fodder availability during the lean season.

In view of providing un-interrupted AI Service to farmers, Community AI Technicians (CAIT) training and AI Refresher course for field staff were provided. A total of 69 CAITs from Wangdue, Bumthang, Pemagatshel, Trongsa and Chukha were trained on AI and 6 livestock Supervisors of Bumthang Dzongkhag were provided AI refresher course during the FY.

Currently, 130 AI centers are operational nationwide. During the FY, 7,559 AIs were performed, resulting in 3,232 progenies (1,014 males and 2,218 females), with a national AI success rate (AISR) of 42.8%. The total AI included the AI performed using sexed semen (2,596 AIs with 1,013 progenies), while other AIs were performed with conventional progeny tested (imported) and pedigree selected (produced at Yusipang) frozen semen. The cumulative AI performed from 1987 to June 2025 is 218,700 and the progeny born recorded is 72015.

To support continuous herd upgradation, the Elite Heifer Breeders' Scheme (EHBS) was initiated to enhance dairy development through commercial dairy heifer production. The scheme was implemented by identifying clusters of potential dairy breeding pockets, particularly in Dzongkhags near the Gyalsung Academy and BRECSA project areas where milk demand is expected to rise. Initially, EHBS was implemented in Bumthang and Trongsa. During the FY the scheme was expanded to Samdrup Jongkhar and Wangduephodrang, registering 553 superior animals across 67 villages in 9 gewogs.

An assessment of the Mithun breeding plan and bull requirement for RMBC Arong was carried out. The Centre also supported the development of breeding guidelines and a comprehensive implementation plan to initiate artificial insemination in sheep and horses for the first time in the country, using frozen semen imported during the Hon'ble MoAL Lyonpo's visit to Mongolia in July

2024. Additionally, continued support was provided for the management of the Royal Soelbam Herd in Zhemgang. A reproductive waste management intervention was implemented in the field, and a study was conducted to assess the performance, supply mechanism, and management system of breeding bulls in the field.

The Dairy Post Production Sector focused on milk quality for introduction of a quality-based milk grading system (QBMGS) which accounts for the compositional and microbial parameters for payment of milk supplied. Research to establish baseline data for milk composition and microbial load is currently underway and upon evaluation of the findings a QBMGS will be instituted. A total of 1010 milk samples were analyzed for milk composition parameters and 977 milk samples were analyzed for microbial load from DFGs of East and East Central region and Gyalsung Academy Dzongkhags during the FY. Further, 69 farmers were trained in hygienic milk production and 41 in product diversification.

The Climate-smart Dairy Solution Sector focused on continued promotion of climate-smart dairy practices. The sector facilitated stakeholder consultations across all 20 Dzongkhags, piloted Sistema-Bio-digesters in the east, supported biogas revival in CRC, Wangkha, and trained livestock staff on an online registration system for biogas installations.

The centre is actively pursuing knowledge management so that knowledge generated is appropriately documented for future references. The centre published the Annual Report, four numbers of Package of Good Practices (digital copy available in www.ndrdc.gov.bt), and four scientific research papers in the Bhutan Journal of Animal Science and other international journals. Real-time data capturing through the National Dairy Information System (NDIS) continued, with 17,364 cattle registered in 19 Dzongkhags (excluding Gasa) and 3,419 AI reports generated. Enhancement of NDIS was carried out to upgrade the system and incorporate Yak information. Online consolidated reporting of Dairy Farmers' Group (DFG) products further strengthened data accuracy for informed planning and monitoring. There are 209 DFG&Cs, of which 199 are functional. There are 6134 members with an average of 30 members per DFG&C.

All aspects of administrative, human resource, and financial management were implemented in strict compliance with government norms and procedures. Along with substantial physical progress made, overall financial progress made in this year was also notable. Out of Nu.49.025 M allocated to the Centre, Nu. 48.983 M was utilized with financial achievement of 99.91 percent.

Table of Content

Background

As part of the institutional strengthening strategy of the Department of Livestock, the erstwhile National Livestock Breeding Programme had been renamed as the National Dairy Development Centre (NDDC) with the mandate to serve as the technical authority for the planning, coordinating, implementing, monitoring and evaluation of dairy development activities of the country. However, with the organizational development exercise conducted by the RCSC, the NDDC has been reorganised as the National Dairy Research and Development Centre (NDRDC) in 2016 with the mandate to carry out need based action research for dairy development in the country. With the recent reform, the Centre has been renamed as National Dairy Development Centre in 2022 with the added mandate of implementing Climate Smart Dairy Solutions.

The major focus of the centre is on dairy development programs that consists of consolidating and strengthening breed improvement program through production and distribution of high-quality specialized inputs (Liquid Nitrogen and Frozen semen), strengthening dairy production and post-production technologies. For faster genetic gain in indigenous and exotic cattle breed, application of progeny tested sexed semen technology is strengthened and embryo transfer technology are being carried out. Additionally, for the implementation of climate smart dairy solutions, up scaling of domestic bio-gas program is being strengthened. Aligned with the 13th FYP, dairy development programs have been intensified to meet the changing need of dairy commercialization and transformation.

Program Profile

Vision

- To be the Centre of Excellence/Knowledge Hub on dairy to ensure livelihood security of farming communities

Mission

- Enhance productivity of dairy cattle for improved National Food and Nutrition Security
- Provide coherent mechanisms to efficiently generate and disseminate knowledge and technologies on dairy farming and climate smart dairy solution

Mandates

- Serve as the apex arm of Department of Livestock for dairy development in the country
- Meet demand for high quality specialized inputs (frozen semen and Liquid Nitrogen) to accelerate dairy breed improvement in the country
- Conduct trainings to impart skills on specialized field of dairy breeding and management, production, post production and climate smart dairy technologies
- Promote and upscale climate smart dairy solutions (domestic bio-gas)
- Co-ordinate and conduct need based dairy research to establish knowledge and generate technologies in support of dairy development in the country
- Package and transfer appropriate technologies and good practices to the end users

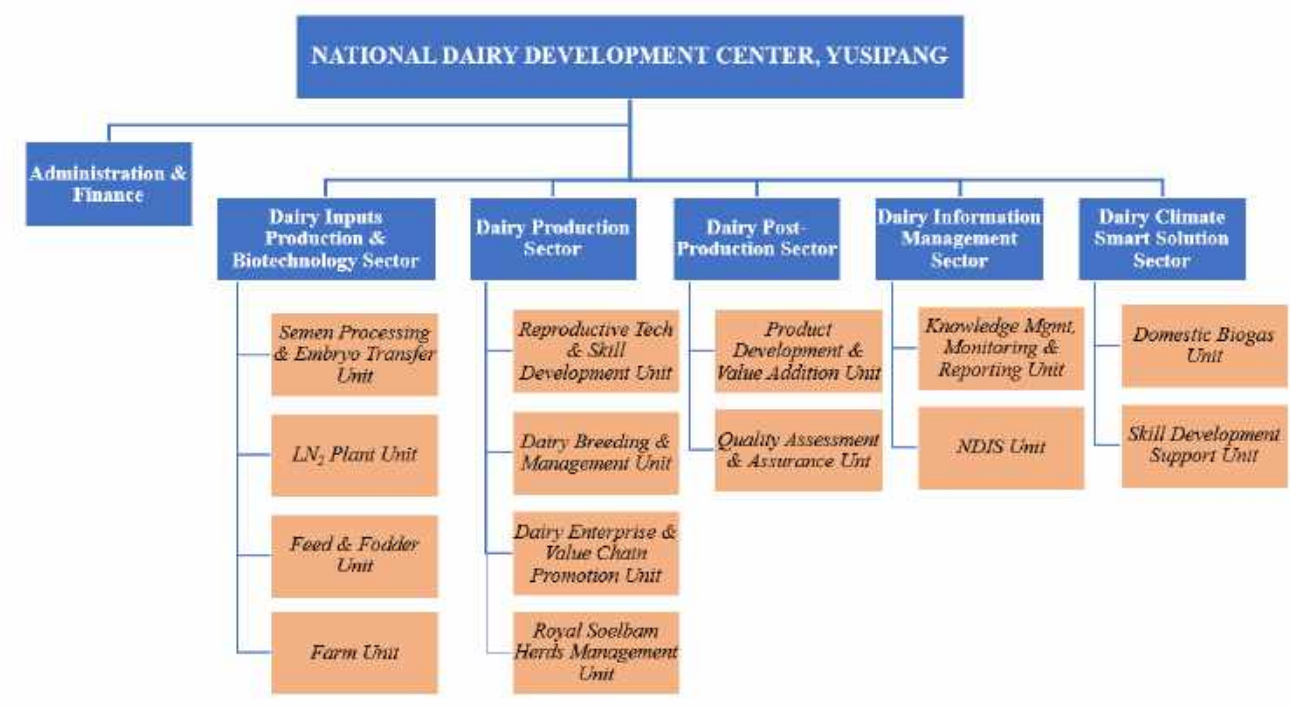
Major functions

- Produce or procure high quality specialized breeding inputs needed for breed improvement
- Develop Standard Operating Procedures, Good Manufacturing Practices and Better Farming Methods to enhance dairy production, dairy product development and value addition and climate smart dairy solution
- Manage National Dairy Information System- to capture real time data for enhanced decision support system

- Prepare annual work plan and budget and manage performance of the center
- Create platform to coordinate and effectively implement Research and Development (R&D) activities
- Coordinate with National Cattle Breeding Centre (NCBC)and Regional Cattle Breeding Centers (RCBC) and other government cattle farms and provide expertise to uphold technical efficiency of farms operation
- Support the Department of Livestock to formulate policies, strategies and guidelines
- Liaise with national and international agencies for collaboration and exchange of technical knowhow

Organizational setups

NDDC has five sectors supported by Administrative and Finance Unit to implement National Dairy Development Program. Due to the reforms, One Sector and two units were added. Dairy Climate Smart Solution Sector, Royal Soelbam Herd Management Unit and Dairy Enterprise & Value Chain Production Unit were added. The revised organogram is as follows:



Dairy Input Production and Biotechnology Sector

1 DAIRY INPUT PRODUCTION & BIOTECHNOLOGY SECTOR

1.1 Liquid Nitrogen (LN_2) Plant Unit

The Liquid Nitrogen Plant Unit operates three LN_2 Plants; One Sterling Cryogenic LN_2 plant installed in 2010 with an initial production capacity of 10 L/hr, One Imtek Cryogenic, Turkey LN_2 Pant installed in March, 2023 with production capacity of 5 L/hr (CNP 120) and a Mini LN_2 Plant with 1 L/hr capacity (CNP 30) at Zhemgang. With the aging of the Sterling LN2 Plant (installed in 2010), the Sterling Plant presently produces around 5.5 L/hr.

Currently, AI services in the country are rendered through the network of 130 Artificial Insemination Centres (AIC) across the country for which LN_2 is an essential component for cryopreservation of frozen semen at ultra-low temperatures. With the implementation of DoL structure reforms and closure of three RLDCs, the Centre took over the schedule distribution of LN_2 and other AI inputs to Dzongkhag Veterinary Hospitals (DVH) of 14 Dzongkhags from January, 2023. The LN_2 produced at the Centre meets the schedule distribution (every 40-45 days interval) of LN2 in the Western, West Central and East Central regions covering 14 Dzongkhags.

LN2 Plants at NDDC, Yusipang

The Centre has Annual Maintenance Contract (AMC) for the three LN_2 Plants with the Contract Firms (M/s ADDCool Trade and Services, Kolkata, India & M/s IMTEK Cryogenics, Turkey). The AMCs are very critical for timely servicing and maintenance of the LN_2 Plants for enhanced long-term performance, optimum LN_2 production and reducing unexpected downtime. The biannual maintenance and emergency visits by Cryogenic Experts will address the deeper mechanical and operational requirements that go beyond daily servicing of the Plants by our Plant Engineers to maintain long term reliability. Regular maintenance by cryogenic experts will enable timely trouble shooting to prevent unforeseen breakdowns of the machines and scheduled major maintenance will keep the LN_2 plant functioning smoothly. The LN_2 Plant machines operates >18 h/day to meet the increasing LN_2 demand with establishment of new AICs and expansion of CAIT program in the country. During the FY 2024-2025, under the collaborative agreement between NDDC and Contract Firms, the Centre made payment of Nu. 224,530 to M/s ADDCool, India and Nu. 778,311 to M/s IMTEK, Turkey for the biannual and emergency visits by the Cryogenic Engineers from the contract Firms.

The Centre produced 50687 L of LN_2 of which 36932 L were distributed to Dzongkhags and Government Nucleus Cattle farms, 9145 L used for semen bank refilling, 2105 L used for semen processing and evaporation losses was 2039 L. The detail of the LN_2 production, distribution and utilization during the FY is shown below.

Details of LN_2 Production & Utilization during the FY 2024-2025

Month	Opening Balance	LN2 Produced	LN2 Distributed	Semen bank refill	Semen Processing	Evapo loss	Total LN2 Utilized
July	134	3503	1911	845	370	170	3296
Aug	341	3861	3358	351	325	168	4202
Sept	0	3807	2767	432	270	170	3639
Oct	168	3793	3437	175	150	167	3929
Nov	32	5830	3996	950	0	170	5116
Dec	746	5700	3633	1200	0	172	5005
Jan	1441	5043	3369	1254	0	170	4793
Feb	1691	3450	3230	975	0	172	4377
Mar	764	4200	3098	900	150	172	4320
Apr	644	3672	2520	870	350	168	3908
May	408	3728	2773	823	370	170	4136
Jun	0	4100	2840	370	120	170	3500
	Total	**50687**	**36932**	**9145**	**2105**	**2039**	**50221**






Frozen Bovine Semen Processing and ET Laboratory Unit

The Frozen Semen Processing and ET Laboratory Unit produces frozen semen from Five cattle breeds (Jersey, Mithun, Nublang, Holstein Frisian and Brown Swiss) at the Centre and distributes to all the AI Centres in the country.

During the FY 2024-2025, a total of 21,425 doses of quality Pedigree selected bovine semen was produced in country and 4,565 doses distributed in the field. At the end of the FY a total 226,910 doses of pedigree selected semen produced in the country is available in the centre as closing balance. The detail is shown in table below.

Pedigree selected Bovine Frozen Semen Production and Utilization during FY 2024-2025

Particulars	Opening balance	Production	Distribution	Closing Balance
Jersey	148175	14335	4355	158155
Mithun	26373	1630	0	28003
Nublang	30438	3475	0	33913
Brown Swiss	2722	1165	60	3827
Holstein Frisian	2342	820	150	3012
Total	**210050**	**21425**	**4565**	**226910**

Further, the Centre imports and distribute Progeny Tested / Genomic Selected (PT / GS) conventional and sex sorted frozen bovine semen for implementation of Elite Heifer Breeders scheme in potential/ identified AI centres (Dzongkhags) and Government Nucleus Cattle Farms.

During the FY 2024-2025, 17,153 doses of Progeny Tested / Genomic Selected Bovine Semen was imported with 12,153 doses of Sex sorted & 5,000 doses conventional bovine semen. The details of sex sorted semen imported are; 5,250 doses (RLDC, Kanglung), 247doses (DLS, Bumthang), 1,093 doses (DLS, Trongsa), 1,019 doses (DLS, Tsirang) and 4,544 doses for NDDC, Yusipang. In addition, the Centre imported Bovine 5000 doses Conventional semen for use in Government Cattle Farms and contract breeders. Further, Planned, reviewed and implemented Sex sorted and conventional semen distributed plans for RLDC (Kanglung), Govt Cattle farms and Dzongkhags. The detail of PT / GS Conventional and sex sorted Bovine semen is shown in table below.

Imported PT / GS Conventional & Sex sorted Bovine Semen

Particulars	Opening Balance	Import	Distribution	Closing Balance
Jersey	10735	5000	2755	12980
Brown Swiss	388	0	50	338
Holstein Frisian	3204	0	540	2664
Tropical Holstein Frisian (Thai HF)	603	0	0	603
Scottish Highland)	97	0	0	97
Buffalo Nilli Ravi	170	0	10	160
Wagyu	860	0	150	710
Sub Total PT/GS Conventional semen		**5000**	**3505**	**17552**
Sexed Semen -Jersey	7090	4541	3376	8225
Sexed Semen- Holstein Frisian	376	0	97	209
Sub Total PT / GS Sexed semen		**4541**	**3473**	**8434**
Total Balance of imported PT / GS Semen		**9541**	**6978**	**25986**

Interspecies Hybridization of Yak and Wagyu cattle

The Inter-species Hybridization of WAGYU (*Bos taurus*) & YAK (*Poephagus grunniens*) is based on Royal command dated 16thJune, 2022. His Majesty commanded the livestock officials to explore cross breeding between Yak and Wagyu cattle in suitable locations. His Majesty advised that interspecies hybridization between Yak and Wagyu cattle may generate valuable animals because of heterosis (hybrid vigour) in progenies owing to combination of useful genes with suitable genotypes. Following the Royal command, the Department of Livestock (DoL, Thimphu) communicated to explore the possibility of introducing Wagyu cattle breed in the country for crossing between the two species (Yak & Wagyu).

During the FY 2024-2025, the Centre in close collaboration with National Highland Development Centre (NHDC, Wangdue), National Livestock Research Centre (NLRC, Bumthang) and Dzongkhag Livestock Sector (DLS, Thimphu) implemented trials on crossing of female Yaks with Wagyu and Mithun frozen semen as well as Mongolian Yak semen using artificial insemination (AI) technology at Summer Yak Grazing areas of Wangdrok and Dungdrok Chiwogs at Dagala Gewog under Thimphu Dzongkhag at an elevation of > 3500 masl (above tree line). A total of 48 female Yaks were inseminated (AI) during the program. Out of the 48 female Yaks, 31 animals were inseminated with Wagyu cattle semen, 12 with Mongolian Yak and 5 with Mithun semen. The female Yaks inseminated (AI) were identified with ear tags as per the National Dairy Information System (NDIS) and all data entered in the online NDIS. The team carried out Pregnancy diagnosis in around 27 Female Yaks inseminated with Wagyu, Mithun and Mongolian Yak semen earlier to determine the conception rate and pregnancy status using per rectal examination and confirmation through PAG test kit. All the inseminated animals were advised to be observed until calving. The team found out that out of the 27 Female Yaks examined about 17 animals were found pregnant on per rectal examination and confirmed through PAG test, while one pregnant animal was lost to wild life predation as per the information gathered from the Herders. The pregnancy success rate was 62.9% for Female yaks inseminated during the program. It was very encouraging to know that the Herders were very proactive and interested in continuing the research trials for at least 4 to 5 years to see visible impact of the research trials. As per observations of some Herders, some female yaks returned to heat /repeated after AI and might be served by Yak bulls. Thus, the actual success rate can be validated after the inseminated (AI) Female Yaks have calved.




Data Collection for Green-house Gas Emission under Soe and Lingzhi Gewogs under Thimphu Dzongkhag

The Centre carried out data collection for scientific study to generate highland data aligned to greenhouse gas inventory under Soe and Lingzhi geogs under Thimphu Dzongkhag during May -June, 2025. Key activities carried out during the study were identifying the animals for data collection, ear tagging of identified animals, live body weight, milk yield, milk composition, soil sample for nutrients analysis, soil organic carbon and grass sample for nutrient analysis.

1.2 Fodder Development Unit

The Fodder Development Unit of the National Dairy Development Centre undertook various fodder production, conservation, and management activities across all four quarters to enhance year-round fodder availability and sustainable forage management. These efforts have significantly contributed to ensuring year-round feed security for the Centre's breeding bulls, ET animals, and associated farms such as Royal Chibta farm at Taba and Royal Soelbam Herd at Ramtokto. The cumulative achievements are detailed below:

A. Activities at the National Dairy Development Centre, Yusipang

During the year, a total of 192 metric tons (MT) of silage was successfully conserved at the Centre. This included 50 MT of pasture grass and willow leaves during the first quarter, 112 MT comprising 62 MT of grass and 50 MT of maize during the second and third quarters, and an additional 30 MT in the fourth quarter.

Additionally, 20 MT of improved hay was conserved from the third harvest of the existing pasture during the second and third quarters. Daily harvesting of green fodder was carried out consistently throughout the year to meet the feeding requirements of bulls and embryo transfer (ET) animals.

To enhance pasture productivity, chemical fertilizers were top-dressed on 30 acres of improved pasture land in the first quarter, with further application and irrigation covering the entire pasture field completed in the fourth quarter. In terms of land development, 1.5 acres were developed for maize cultivation, and 0.133 acres were developed for improved pasture, both during the final quarter.

To supplement internal production, 25 MT of Napier grass was procured from RCBC Wangkha in the first quarter. In addition, approximately 1 MT of Khempa shing (artemisia), a local invasive weed, was manually uprooted around pasture and maize fields and processed for biochar production during the second quarter. Protective boundary fencing was also completed during the fourth quarter to safeguard pasture areas from encroachment and free grazing.

B. Activities at Royal Soelbam Herd, Ramtokto

At the Royal Soelbam Herd in Ramtokto, **60 MT of maize silage** was conserved during the second and third quarters and kept under fermentation. Furthermore, **3 acres of winter oats** were cultivated to supplement green fodder availability during the lean season, particularly for blending with maize silage, paddy straw, and local hay.

C. Activities at Royal Chipta Farm, Taba

The Royal Chipta Farm in Taba successfully conserved **30 MT of improved hay** from the second and third harvests. The hay was carefully dried, transported, and stored under shed roofing to preserve quality and support winter feeding.

1.3 Farm Unit

The Farm unit manages Semen Donors bull and Embryo Transfer (ET) donor cows for the genetic improvement of cattle. Proper management of semen donor bulls and ET animals in the farm play important role for the production of quality bovine semen and viable embryos for cryopreservation.

Animal strength in the farm

The farm unit houses a total of 34 animals, including 18 elite semen donor bulls of various breeds and 16 ET donor animals (11Thrabam and 5 Jersey crossbred). During the FY 2024-2025, the Centre procured 2 young Semen donor bulls (1 Jersey and 1Holstein Friesian bulls) to increase the number of semen donor bulls and plan semen distribution in the field. The breakdown of the animal strength maintained in the farm is provided in the table below:

Details of cattle maintain in the Farm

Semen Donor Bulls	Nos	ET Animals & Calves	Nos
Pure Jersey	7	ET Jersey Milking	1
Mithun	3	ET Donor Cows (Jersey Cross Dry)	4
Nublang	3	ET Donor Cows (Thrabam Milking)	1
Brown Swiss	1	ET Donor Cows (Thrabam Dry)	10
Holstein Friesian	2		
Scottish Highland X Thrabam	2		
Total Semen Donor Bulls	18	Total ET Cow/Heifer/Calves	16

Disease screening of Farm animals

Blood samples from all animals at the NDDC farm are routinely collected for disease screening. The National Centre of Animal Health (NCAH, Serbithang) conducts mass screening to detect Brucellosis (a zoonotic disease of significant concern) and other contagious / venereal diseases. The screening is carried out across three sheds housing the animals at the farm, ensuring comprehensive health monitoring and early detection of potential infections. This proactive approach helps maintain herd health, early detection of any diseases, and safeguard both animal and public health. During the FY,

the Centre generated Revenue of Nu. 241048 through sale of milk and culling of unproductive farm animals.

Farm Bio-security

Strict Farm Bio-security is maintained at the farm at all times to protect the elite animals against the entry and spread of diseases from other animals, vehicles and human.

Vaccination and Deworming of Farm animals

All farm cattle are regularly and timely vaccinated as per schedule and dewormed as per laboratory results, achieving 100% Vaccination and deworming coverage for the fiscal year. The Vaccinations for Black Quarter (BQ) and Hemorrhagic Septicemia (HS) were administered in July, 2024 and June, 2025, while Foot and Mouth Disease (FMD) vaccinations were administered biannually in July, 2024 and January, 2025. Additionally, the farm carried out Lumpy Skin Disease (LSD) vaccinations for all animals on August 23, 2024, ensuring comprehensive protection against these critical diseases. Deworming of cattle at the farm was conducted twice a year, based on fecal sample results provided by NCAH, Serbithang. The deworming program primarily targeted both mature and immature liver flukes, as well as various species of roundworms. Detailed information on vaccination and deworming schedules is presented in the table below:

Vaccination and Deworming records at the Farm

Vaccination	Semen Donor Bulls	ET animals & Calves	Period
FMD	21	25	July 2024
FMD	17	17	January, 2025
BQ/HS	21	21	July, 2024
BQ/HS	17	11	June, 2025
LSD	18	16	August, 2024
Deworming			
Liver fluke	21	25	August, 2024
Liver fluke	21	25	December, 2024
Round Worm	0	8	March, 2025

Record of medicine and vaccines used at NDDC farm

Medicine at the farm were judiciously used and indented online to NCAH Serbithang as per the need and budget allocated to the centre. The Percentage of medicine and vaccine usage by the Centre is shown below.

Percentage of medicine used by the Centre

Sl. #	Drugs Group	Volume used (%)	Balance (%)
1	Antimicrobials	70%	30%
2.	Anthelmintic	80%	20%
4	Vitamins & Minerals	90%	10%
5	Ectoparasite	95%	5%
6	Antihistaminic	80%	20%
7	Analgesics & Antipyretic	70%	30%
8	Hormones	70%	30%
9	Disinfectant drugs	100%	Nil

Percentage of Vaccine usage by the Centre

Vaccine	Received date	Doses received	Doses used	Remarks
BQ & HS	15th April, 2025	50 doses	50 doses	100% used
FMD	15th April, 2025	50 doses	50 doses	100% used
LSD	24th July, 2024	50 doses	50 doses	100% used

Dairy Production Sector

2 DAIRY PRODUCTION SECTOR

2.1 Dairy Breeding and Management Unit

AI performance at national level

The Artificial Insemination (AI) services are catered through the network of 130 AI centres in the country. During the financial year 2024-25, a total of 7559 AI was performed nationwide and recorded 3232 progenies, leading to AI success rate (AISR) of 42.8%. The performance of the Dzongkhags in terms of AISR, Mongar dzongkhag has performed the best (76.4%) followed by Tsirang (62.1%). Compared to national average AISR, all dzongkhags in western and west-central region except Tsirang, East-central region except Sarpang and Lhuentshe and S/Jongkhar had underachieved the performance. Therefore, the Dzongkhags need to relook at the AI service delivery arrangements, with particular focus on follow-up on progeny born after AI as farmers usually do not report the male progeny born in their herd.

AI performance and success rate during the FY 2024-25 (as of May 2025)

Dzongkhag	Quarter I			Quarter II			Quarter III			Quarter IV			Total				AISR (%)
	AI	M	F	AI	M	F	AI	M	F	AI	M	F	AI	M	F	Total	
Thimphu	46	0	17	75	1	12	78	3	23	51	6	20	250	10	72	82	32.8
Paro	99	9	18	84	11	20	76	19	26	55	5	8	314	44	72	116	36.9
Ha	7	0	0	7	0	1	8	0	0	2	0	0	24	0	1	1	4.2
Chukha	138	13	32	108	23	9	29	11	10	8	1	2	283	48	53	101	35.7
Samtse	125	4	8	87	4	2	134	10	15	96	18	23	442	36	48	84	19.0
Gasa	39	2	2	21	1	4	25	2	13	16	2	6	101	7	25	32	31.7
Punakha	139	12	43	133	10	29	148	18	41	129	5	30	549	45	143	188	34.2
Wangdue	40	5	10	46	3	10	22	2	4	90	5	8	198	15	32	47	23.7
Tsirang	189	32	57	133	36	85	155	24	61	117	24	50	594	116	253	369	62.1
Dagana	108	21	32	112	25	24	74	8	5	65	9	12	359	63	73	136	37.9
Bumthang	55	1	8	71	2	10	33	1	4	6	1	3	165	5	25	30	18.2
Trongsa	50	10	9	39	6	8	62	11	15	35	6	9	186	33	41	74	39.8
Zemgang	39	0	8	42	3	10	30	0	5	17	2	6	128	5	29	34	26.6
Sarpang	132	13	60	224	20	66	153	11	62	60	4	22	569	48	210	258	45.3
Lhuentshe	97	0	6	93	0	2	123	2	13	29	4	9	342	6	30	36	10.5
Mongar	348	54	97	303	85	155	216	131	187	176	27	61	1043	297	500	797	76.4
T/yangtshe	20	2	17	24	2	3	27	2	8	16	0	7	87	6	35	41	47.1
T/gang	143	8	40	164	10	49	150	21	63	72	18	41	529	57	193	250	47.3
P/gatshel	372	42	89	165	13	39	272	48	93	70	15	34	879	118	255	373	42.4
S/jongkhar	168	10	28	108	4	14	166	22	69	75	19	17	517	55	128	183	35.4
Total	**2354**	**238**	**581**	**2039**	**259**	**552**	**1981**	**346**	**717**	**1185**	**171**	**368**	**7559**	**1014**	**2218**	**3232**	**42.8**

The total AI included the AI performed with sexed semen, which accounts to 34.3%. Other AI were from conventional progeny tested (imported) and pedigree selected (produced at Yusipang) frozen semen. The sexed semen was used in areas under Heifer Production Scheme (HPS) and Elite Heifer Breeders Scheme (EHBS). The progeny tested semen were used in CHBPP areas and pedigree selected semen were used in all areas beyond the HPS, EHBS and CHBPP as well as the same areas in animals that are repeaters and cows beyond 3rd lactations.

Application of Sexed semen technology

The sexed semen technology in the country has been initiated its implementation under "Heifer Production Scheme" in 2019-20. Sexed semen are distributed as per feasibility in field for use in heifers and cows up to third lactation according to its usage protocol titled *"Guidelines for use of Sexed/ Conventional semen and Implementation Modalities for Heifer Production using Sexed semen", NDRDC (2019): 11.* During the financial year 2024-25, a total of 2596 AI were performed with sexed semen and recorded 1013 progenies, marking AI success rate of 43.9%. The female progeny birth was 88.9%, which is within the recommended female birth range of 80-90% by the sexed semen producing company.

Progress of AI with Sexed semen technology (As of May 2025)

Dzongkhag	Quarter I			Quarter II			Quarter III			Quarter IV			Total			AISR (%)
	AI	M	F	AI	M	F	AI	M	F	AI	M	F	AI	M	F	
Thimphu	38	0	17	49	0	10	67	2	22	16	1	4	170	3	53	32.9
Paro	26	1	11	29	0	8	23	1	11	9	0	0	87	2	30	36.8
Had	7	0	0	7	0	1	8	0	0	0	0	0	22	0	1	4.5
Chukha	57	1	16	53	10	8	22	6	10	5	1	2	137	18	36	39.4
Samtse	31	0	4	21	0	0	49	0	5	8	0	0	109	0	9	8.3
Gasa	20	0	1	13	0	2	14	0	7	5	0	1	52	0	11	21.2
Punakha	72	0	23	69	3	16	78	6	28	43	1	10	262	10	77	33.2
Wangdue	20	0	3	22	0	4	13	1	2	1	0	0	56	1	9	17.9
Tsirang	68	6	34	45	1	44	49	2	35	23	1	12	185	10	125	73.0
Dagana	30	1	14	7	1	14	25	2	0	10	1	5	72	5	33	52.8
Bumthang	25	1	8	24	1	8	11	1	3	0	0	0	60	3	19	36.7
Trongsa	11	0	3	12	0	1	9	0	2	3	0	0	35	0	6	17.1
Zemgang	35	0	8	34	1	9	22	0	5	6	1	2	97	2	24	26.8
Sarpang	69	0	26	89	3	36	64	1	30	24	1	9	246	5	101	43.1
Lhuentse	63	0	6	32	0	2	55	0	9	10	0	3	160	0	20	12.5
Mongar	62	10	42	37	4	43	39	1	59	18	3	14	156	18	158	112.8
T/yangtse	11	0	9	6	1	2	8	0	8	6	0	2	31	1	21	71.0
T/igang	54	3	39	51	1	13	37	6	21	12	3	7	154	13	80	60.4
P/gatshel	108	11	43	41	2	16	94	8	42	26	1	16	269	22	117	51.7
S/jongkhar	96	7	26	48	1	14	83	5	37	9	1	6	236	14	83	41.1
Total	**903**	**41**	**333**	**689**	**29**	**251**	**770**	**42**	**336**	**234**	**15**	**93**	**2596**	**127**	**1013**	**43.9**

Since the inception of the scheme, the sexed semen technology has been reached to 80 AI outreach centres in the country, and recorded cumulative performance of 12,203 AI and 4,029 progenies (Male: 455 and female: 3,574). This recorded overall AI success rate of 41.9% and female birth of 88.7%.

Assessment of Breeding Bull Supply Mechanism, Management System and Performances, and Reproductive Efficiency of Village Cattle Herds in West-Central and East-Central Regions

The study was conducted to assess the performance, supply mechanism and management system of breeding bulls in the field. The reported performance of breeding bulls maintained at the National Dairy Development Centre, Yusipang was compared with the validated performance of same bulls collected from field to cross-check the reporting system. A total of 84 breeding bulls were visited and interviewed 195 beneficiary farmers. The reported performances of breeding bulls on services, progeny born and natural service success rate were 14.9±19.4/bull/year (mean±SD), 8.8±14.0/bull/year and 48.1±30.5% respectively, and the validated performance on the same were 40.6±32.9/bull/year, 28.3±26.3/bull/year and 65.6±21.5 respectively. Significant differences were observed between the reported and validated performances (p=0.000) of the bulls, which indicates

some errors in reporting system. Therefore, performance reporting system of bulls need to be improved through application of web-based database as accessible at www.ndis.gov.bt, by providing hands-on training to the key users such as CBK/PBK/ livestock field staff on its application.

In rural areas, scrub bulls still dominate the breeding system as evident by low coverage of certified breeding bulls in field (42.9%). The breeding bulls were supplied mostly through community request (85.6%) and they were effectively managed. The bulls in field were found healthy with average BCS of 3.05±0.58, and no significant difference was observed between the two regions. The existing bull management system compliments the preferred bull management system. The payment of mating allowance showed positive impact on health and performances of breeding bulls. Most of the certified breeding bulls (94.1%) once placed in field were not screened against contagious diseases. Replacement of breeding bulls within three years in a location and sterilization of scrub bulls were poorly followed. Therefore, the assessment recommends that existing system of community procurement and its management by a Contract Bull Keeper at his/ her homestead and payment of mating allowance, annual disease screening, timely replacement of bulls and sterilization of scrub bulls in the community should be followed for better efficiency in management and utilization of certified breeding bulls.

Overall, the mean reproductive efficiencies of village cattle herds in terms of AFB, BaC and ICP were 33.07±5.75 months, 7.95±2.29 months and 18.73±3.28 months respectively, which were very high compared to maximum recommended timeline of 24 months, 6 months and 15 months respectively for equilibrium in dairy farming.

Reproductive Waste Management Intervention

During the financial year, a total of 320 animals presented for gynaecological examination were examined via trans-rectal palpation. Among the animals examined, 215 animals were found with reproductive disorders of ovarian origin and subjected to hormonal treatments as per findings. Other animals were found either pregnant or in heat, and those in heat were inseminated with frozen semen as deem required. Among the animals treated with hormonal drugs, 178 animals responded to treatment, which equated to 82.8%. The animals were inseminated artificially or naturally (RSH, Wangdigang).

Gynaecological examination of animals, treatment and response rate

Location	Intervention period	Animals examined	Treated for RWM	Responded to treatment	Response rate (%)
Chukha- RCBC, Wangkha	20-24/08/2024	33	25	20	80.0
	12-14/02/2025	17	8	7	87.5
Wangdue- Khotokha	14/11- 13/12/2024	36	19	15	78.9
Sarpang- Gelephu, Samteling, Dekiling, Sompangkha	23-31/12/2024	62	42	33	78.6
Bumthang- Chokor	08-30/04/2025	34	23	15	65.2
Bumthang- NCBC	08-30/04/2025	19	8	6	75.0
Pemagatshel, Khar	21/4- 8/5/2025	45	40	38	95.0
Trongsa- Nubi, Tangsibi, Langthil	11-26/05/2025	50	29	25	86.2
Chukha- Darla	27/5- 11/6/2025	10	9	8	88.8
Trong- RSH, Wangdigsng	09-15/06/2025	14	12	11	90.0
Total		**320**	**215**	**178**	**82.8**

Revival of the farm at RCBC, Wangkha

Following the directives from the DoL to resume normal breeding and production activities at the RCBC, Wangkha, a team from NDDC, Yusipang visited the centre from 20 – 24 Aug. 2024 and undertaken the following activities at the centre;

- Review the existing farm infrastructures and other facilities
- Physical and Gynaecological examination of the animals in the farm and assess their status for breeding fitness vis-à-vis culling of animals with disorders/ deformities
- Study farm topography and potential for pasture/ fodder production and conservation to facilitate the use of farm resources at full capacity
- Review farm bio-security measures in place at the centre and HR requirements

The detail report for revival of farm activities at RCBC, Wangkha was submitted to the Department, and the gist of which are summarized below.

a. Review the existing infrastructures and farm machineries

The centre has five (5) animal sheds including one open animal holding shed with provision of feeding trough. Based on the infrastructure, the farm has total carrying capacity to hold 80 Livestock Units (LU). The RCBC Wangkha has mostly rough terrain topography of 30 to 45-degree gradient that poses difficulty in mechanization of the farm. Therefore, few essential farm machineries such as a new tractor, Chaff cutter and milking machines are required to manage the farm in efficient mode.

b. Physical and Gynaecological examination of the animals in the farm and assess their status for breeding fitness vis-à-vis culling of animals with disorders/ deformities

The RCBC, Wangkha has 37 animals in the farm including 4 bulls, comprising of Jersey crosses and Karan Fries (KF) crosses with exotic blood level of 50 – 96.9% as per record (F1 – F5). All female cattle in the farm (n=33) were examined individually for health status by way of body condition scoring (BCS). Upon physical examinations, all animals were found healthy with BCS of 2.5 – 4.5 on a scale of 1 – 5. At the same time, the reproductive health of the animals was assessed via trans-rectal examination of reproductive organs. Most of the animals examined had smooth ovaries and fall under exhibiting true anoestrus (45.4%, n=33), followed by developing ovaries and active CL (24.2%), Persistent CL on ovary (12.1%), and Cystic ovary (12.1%). Based on the diagnosis, animals were treated using hormonal drugs to rectify the disorders and induce estrus in animals to start the heifer breeding activities at the centre. Based on the findings of examinations, 18 Jersey cross heifers in the herd (54.5%, n=33) were found breedable with the application of assisted reproductive bio-technologies (ART) and advised to retain in the farm. The remaining 15 animals (45.5%) were advised for culling, which includes Karan Fries crosses (n=7) and all four bulls.

c. Study farm topography and potential for pasture/ fodder production and conservation

The centre has a total of 113.55 acres of land, of which 50 acres are under pasture development comprising mostly of Napier Pakchong-1 Hybrid Grass and the remaining 60 acres of field were under cultivation of sub-tropical pasture species and fodder tree plantation (Figure 5). However, most of the sub-tropical pasture fields are depleted and warrants pasture renovation. Considering the rocky and

steep terrain of the farm area, the expansion of pasture area is limited. However, there is scope to increase fodder production in such areas through plantation of suitable fodder trees of local varieties.

d. Review farm bio-security measures in place at the centre and HR requirements

The location of RCBC lies along the national highway (Phuntsholing – Thimphu) posing a high risk of disease outbreaks in the farm. Nevertheless, the farm management has instituted strict farm bio-security, where possible with the available facilities such as main entrance gate with vehicle-dips and foot-dips for visitors. Further, some interventions required to improve farm bio-security included the following;

- Construction of chain-link fencing of farm areas along the side of the national highway in place of barbed wire fencing to prevent the entry of stray animals and trespassers
- Construction of a farm road within the farm along the chain link fencing to collect fodder from the field deploying a tractor
- Modification and development of foot-dips at appropriate locations especially at the entrance gate to disinfect all entering the farm areas
- Recruitment of a gatekeeper/ night guard to keep vigilance of people and animals entering the farm premises

2.2 Dairy Enterprise and Value Chain Promotion Unit

Implementation of Elite Heifer Breeders' Scheme

The Elite Heifer Breeders Scheme (EHBS) aims to up-scale dairy farmer's dairy herd to elite mother dairy farms to increase population of superior heifers in shortest possible time and meet its increasing demand within the country, using state of art sexed semen technology.

Accordingly, during the fiscal year, the EHBS activities was initiated in three Dzongkhags of Samdrup Jongkhar, Trongsa and Wangdue Phodrang for dairy development. The initiatives were carried out in close consultation with Dzongkhag Livestock Sectors that are in the proximity of prioritized Gyalsung Academy and BRECSA project supported Dzongkhags, where the demand for milk and milk products is likely to rise and the implementation of EHBS is an alternative to mitigate the emerging need of milk and dairy products in the field. During the EHBS implementation phases, the following activities were carried out.

a. Briefing for awareness and advocacy to farmers

The team briefed farmers for half a day on Elite Heifer Breeder Scheme (EHBS), its purpose, operational modalities, criteria for selection of Dzongkhag/Gewog/Village, and field implementation of EHBS activities in all the selected dairy intensive areas. The participants were presented with discussion on Smart farming techniques including breed selection, feeding and management, animal health management, clean milk production, record keeping, hygienic product processing and marketing of milk and dairy products. Further, advocacy and briefing were done to create awareness on latest sexed semen technology that ensures 85-90% female birth, its judicious usage in heifer and cows up to second lactation and right time of artificial insemination for a greater number of calf crops.



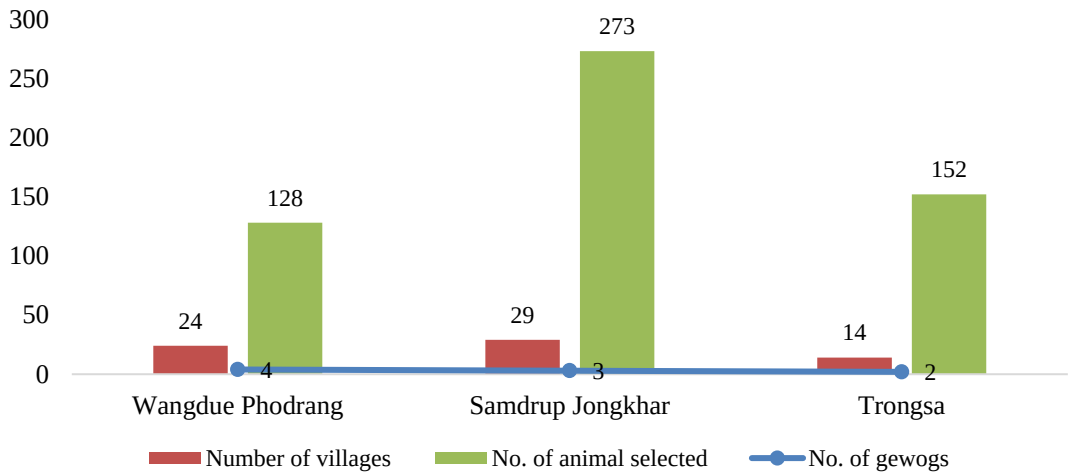
b. Animal selection, identification with NBIN and registration

The team transacted through all identified villages for animal selection. Best of the best animals/ superior cows/heifers with of >50% exotic bloodline of Jersey inheritance and fulfilling Jersey breed characteristics in each selected village were selected to participate in EHBS. The animals selected were ear tagged with unique National Bovine Identification Number (NBIN), animal along with owner's details were registered for uploading in National Dairy Information System (NDIS) records.

To encourage animal performance recording, individual bovine register was issued for each animal with inscribed animal details pedigree of animals and other details of animals. The selected animals are eligible for insemination with sexed semen supplied by NDDC Yusipang. The detail record of each individual animals along with owners' details were registered in excel data sheet and uploaded in web-based NDIS. Besides, individual animal bovine register was filled with required details including owner's details and the filled bovine register for each animal were issued to farmers for future record keeping.



During the implementation phases of EHBS, the team identified potential dairy breeding pockets and registered 553 superior animals available in the 67 villages of 9 gewogs in the three Dzongkhags as detailed in Figure below.



c. Field Observations and Recommendations

The advocacy and awareness program on EHBS to the dairy farmers from the three Dzongkhags has provided limelight on the importance of dairy breed improvement. The participating farmers have availed understanding on the sexed semen as an emerging technology for breeding, thus contributing to herd improvement, enhance milk production and opportunity for income generation. The farmers have also realized the importance to maintain records in farm operation for periodic assessment and to make informed decision. The dairy farmers have shown interest and are forthcoming to embrace the EHBS in their communities. However, some of the recommendation for taking forward the EHBS in the piloted areas includes the following:

- Consistent follow-ups, farmers' advocacy and training are required for better uptake of dairy technologies to make dairying a sustainable livelihood option of the area farmers
- Ensure timely supply of sexed semen and AI associated inputs for genetic upgradation of the existing animals with the farmers through AI technology
- Capitalizing on the retired livestock staff as CAITs in the identified gewogs who is already providing the services. Besides, there is need to train additional CAITs to increase the AI coverage in the areas.
- Reviving/formation of the DFG in the gewogs for collective milk production, processing and marketing which are dormant or does not exit one in the identified gewog.

Feasibility studies to establish Commercial Dairy farm through Economic Stimulus Plan

NDDC facilitated proponent of four dzongkhags to conduct feasibility study, develop dairy business plan/investment plan to establish Commercial Dairy farm at Wakleytar, Tsirang, Samkhar, Tashigang; Deothang, Samdrup Jongkhar and Dopsari, for seeking support from Economic Stimulus Plan fund support.

Dairy Investment Plan for Model Rehabilitation Project at Dhanesey, Tsirang

As per the directives from higher authorities a multi-stakeholder platform coordinated by National land Commission was formed to develop an investment plan for dairy farm establishment has been developed for Dhanesey, Patshaling, Tsirang. This location has more than 4000 acres of land that is to be rehabilitated resetting land less and displaced Bhutanese citizens.

This initiative is for effective utilization of land to establish semi/commercial dairy farms to gear towards greater self-reliant on dairy products and enhance rural income. The total investment cost of Nu.2.613 million is foreseen for establishment of semi-commercial dairy farm with 15 milking cows and its followers. With government subsidy support (cost sharing policy for housing, farm machinery and cattle purchase) to the tune of Nu 0.738M the farmers still have to invest about Nu 2.0 M through soft loans or other means.

Land requirement depends on estimated carrying capacity of pasture to feed the targeted number of animals year-round. For 15 cow unit dairy farm 25 acres land is required based on carrying capacity of the pasture cultivated on available land (15 acres for adult cows with calf, 9 acres for heifer and young bulls and 1 acre for infrastructure such as cow, heifer and calf sheds and store required for the farm. Feed requirement is about 17 MT/annum for supplementary feeding of milking cows and calf.

Review of breeding plan/activities of National Mithun Breeding Centre (NMBC), Arong

As directed by DoL, field visit was made to assess Mithun Breeding plan and bull requirement for RMBC Arong. NMBC Arong has a total strength of 126 animals (all categories) of which 91animals are adult females (Heifer 33% (40), Cow in milk 19% (23) and dry cows 23% (28), female calves (16) and rest are Rilang cross, male calves and breeding bulls (July 2025).

The farm had three breeding bulls (one 7 years old and two young bulls of 3 years age) in the recent past. However, one young breeding bull was attacked and killed by Rilang (wild Gaur bull) which frequently encroach the farm area during breeding season.

Ideally one breeding bull is required for 20 breedable female and at the maximum of 25 female per bull, depending on the age of bull and physical fitness and desired scrotal circumferences of >30 cm for higher semen production and resultant higher fertility. There are only two breeding bulls (One old 7 years and

one young 3 years) to mate 91 breedable female and 16 female calves that will be breedable in near future, farm would require four additional breeding bulls, because one of the existing breeding bulls is old and it would need replacement soon and only one would remain active. Further bulls have to be rotated in subsequent generation to avoid inbreeding for atleast five generation to avoid deleterious effect of inbreeding in the herd. Hence RMBC proposal to procure five (5) Breeding bulls from NRM, ICAR, Dimapur, Nagaland is found valid and justified. Accordingly, expert technically supported NMBC to develop proposal to procure Mithun breeding bull from ICAR NRM, Dimapur, Naga land and helped to seek approval of Secretary DARE/ DG, ICAR New Delhi.

Breeding guidelines, implantation plan to initiate artificial insemination in Sheep & Horse

As requested by the respective farms, the Breeding and Management Specialist of NDDC visited Equine and Sheep Farm Bumthang and provided technical expertise to steer National Sheep and National Horse Farm, at Bumthang and provided expertise to prepare Breeding guidelines and comprehensive implementation plan to initiate artificial insemination in sheep and horse for the first time in the country with frozen Semen imported during MoAL Lyonpo's visit to Mongolia in July 2024.

Feasibility Study Report on Establishment of Semi-Commercial Dairy Farm Neytsheyphu, Dopsari, Paro

The proposal for establishment of semi-commercial dairy farm was put up to the Department of Livestock by the Zhibda Gonor Detchen – a four-member dairy farmers group which is a subsidiary group under Dopsari Dairy Group. The subsidiary group is led by Mr. Phurba Gyeltshen and have intended to set-up a dairy farm with 15 milking cows on the 4.5 acres of government leased-in land located at Neytsheyphu under Dopsari gewog, Paro. The proposal for establishment of the semi-commercial dairy farm was initially submitted to Dzongkhag Livestock sector (DLS), Paro and it was reviewed by the technical team comprising of members from NDDC, Yusipang and DLS, Paro during the month of October, 2024. The review of the proposal was done to facilitate the possibility to avail additional agriculture related loan to complete the on-going farm establishment activities. Considering that the DLS, Paro do not have available budget to provide subsidy support to the proponent for establishment of the semi-commercial farm, it was recommended that any possible technical support will be rendered by the DLS based on the available budget with the sector. Subsequently, as per the directives received from the Department of Livestock to conduct a feasibility study of the farm on the economic aspects for additional support to process loan and mitigate the establishment cost of the farm. The joint feasibility study was conducted by a team from NDDC Yusipang, DLS Paro and gewog extension on 6th November, 2024.

2.3 Reproductive tech and Skill Development Unit

AI skill development training and refresher course

The dairy production is one of the major livelihood activities in the country. During the financial year the Dzongkhag Livestock Sectors of Wangdue, Bumthang, Pemagatshel, Trongs and Chukha has organized AI skill development training to "***Community AI Technician" (CAIT)***, in the dzongkhags with technical support from National Dairy Development Centre (NDDC), Yusipang, under the Department of Livestock (DoL), Ministry of Agriculture & Livestock. The trainings were coordinated nationally by the NDDC, Yusipang. In Bumthang dzongkhag, AI refresher course was also conducted for a week towards the end of the training at the same time. A total of 69 CAITs were trained on AI and 6 livestock staff were provided AI refresher course during the FY 2024-25.

AI skill development training and refresher course conducted during the FY2024-25

Dzongkhag (Location)	Schedule	No. of CAIT Participants	AI refresher course (staff)	Remarks
Wangdue (Khotokha)	15/11-12/12/ 2024	16	NA	CAIT training
Bumthang (DVH, Chokor)	08-30/04/2025	8	6	AI training & refresher
Pemagatshel (LEC Khar)	16/04 -13/05/ 2025	30	NA	CAIT training
Trongsa (LEC, Langthil)	16-26/05/2025	10	NA	CAIT refresher course
Chukha (LEC, Darla)	27/05-11/06/2025	5	NA	CAIT training

The trainings aimed at strengthening Public-Private Partnership in cattle breed improvement program via rendering uninterrupted Artificial Insemination (AI) services to the dairy farmers of the Dzongkhags, which directly complement the objectives of DoL to enhance employment andincome generation opportunities in rural areas. The successful participants were awarded with the training completion certificate.

2.4 Royal Soelbam Herd Management Unit

a. Construction of Cattle Holding Area through Excavation

The farm area at erstwhile Regional Mithun Breeding Farm, Wangdigang has terrain slope and it is difficult to keep the cattle during night in the sloppy area. Also, there is no proper area to hold and keep the animals during monsoon season. Subsequently, it was planned during this FY 2024-2025 that a site will be developed into cattle holding area by excavating the plot of land at Wangdigang to keep the Soelbams during the night. Therefore, a Backhoe Loader was hired to carry out the earthwork excavation for 68 hours (8 hours per day for 8 and half days). Since the tender for FY 2024-2025 for hiring machinery was not floated by Zhemgang Dzongkhag, the excavation work was based on the FY 2023-2024 tender quoted rate of Nu. 1,680.00 only for an hour. However, the K-Zomba Hiring, Zhemgang had agreed to undertake the earth excavation works below the quoted rate at Nu. 1,600.00 only per hour. The total earth excavation work of 1,120 cubic meter (16m X 10m X 7m) is completed to develop the cattle holding area.

b. Annual Soekha for the Welfare of Royal Soelbam

The *Soekha* is a traditional practice conducted for the welfare of Royal Soelbam over a long time and this practice need to be preserved and practiced further. The *Soekha* is conducted before the herd leaves for migration to ensure safety and wellbeing of the Soelbam and sentient being. According to the Norpon, the management of erstwhile RLDC, Zhemgang used to provide the financial support to conduct the rituals from the approved annual budget for Royal Soelbam when the management was under the RLDC. Subsequently, with the approval of the Department to take forward the traditional practices, the annual *Soekha* was conducted through the approved capital budget for the FY.

c. Supply of butter for Winter Kurim at Punakha from Royal Soelbum

For the annual *Kurim* at the Punkha Dzong, upon the instruction from the Office of the Gyalpoi Zimpon (OGZ) regarding the sourcing and supply of butter required for *Kurim* at Punakha. The center sourced 122 kgs (79 *phogs*) of butter from RSHM, Zhemgang and supplied for winter *Kurim* in Punakha Dzong.

d. Construction of Animal Attendant Quarter at Migratory Site

The construction of the residential quarter was imperative for the welfare of attendants while staying at the migratory sites at Chumoluti. Majority of the construction was fund supported by the Divisional Forest Office, Zhemgang with the available budget of **Nu. 300,000.00** ***(Nu. Three hundred thousand)*** only. However, due to limit budget with the DFO Zhemgang, all works could not be completed and subsequently they have requested our intervention to support the balance work of providing CGI roofing for the quarter. The total cost for providing the CGI roofing as per estimate by the Dzongkhag Engineer, Zhemgang is **Nu. 88,083.88** ***(Nu. Eighty-eight thousand eighty-four)*** only. Subsequently, support to supply the required materials was placed through the competitive bidding and supply to the Royal Soelbam Herd.



e. Animal registration through ear-tagging

For the identification of the Royal Seolbam and to keep record of the existing animals in the herd, the initiative to register the Soelbam was undertaken during the FY 2024-2025. The animal identification was done by ear-tagging the animal with **RED** colored ear-tag especially for Royal Soelbam and is unique from the other category of animal identification. The total of 84 Soelbams were registered with the serial number from 2008799999 to 2008880083. The new registration number excludes the old identification numbers tagged to the Soelbams. Among the animals that were ear-tagged, 25 were Jatsham, 33 Yangkum, 16 were Doebum, 2 were doethram, 11 were Thrabum, and 7 were Jersey crosses.


f. Pasture Development at Wangdigang

The pasture field at Wangdigang were degraded and in need of pasture renovation. Since the area being in mid-altitude, there was no appropriate fodder species available besides Napier grass *(Pennisetum purpureum)* that can grow in the area. However, Napier grass are appropriate in the cut and carry management system and it is not feasible to cultivate in large area as fodder where the cattle are left for grazing in the paddock. Since the Royal Soelbam herd consist of local cattle and they are managed under free grazing system, the alternative option of cultivating Kikuyu *(Pennisetum clandestinum)* as fodder was done in four acres of land. Kikuyu is fast growing and spread rapidly in wider area, it can be used as pasture for cattle besides the elevation of the area is suitable for proper growth of Kikuyu.


g. Animal Feed Supply

Based on the demand of the animal feed required for the Royal Soelbams, the center had provided 16.6 MT of animal feeds for management and maintenance of Royal Soelbum during the FY 2024-2025. The animal feeds were supplied in peace-meal in five batches and details of feeds supplied includes:

i. Milk ration (Pelleted Karma Feed) 7.60 MT
ii. Cattle concentrate (Pelleted Karma Feed) 8.00 MT
iii. Calf starter 1.00 MT

h. Supply of tools and equipment

For bringing efficiency of management of the RSH at Wangdigang, some tools and equipment like brush cutter with spare parts (1 No), curd percolator (2 Nos) and farm tools such as crowbar, hammer, spade, pick axe etc were bought from the RSH management budget and handed them over to the Norpoen. The usage of curd percolator was demonstrated to the Norpoen.

i. Maintenance and Installation of light

Owing to frequent attack of milking animals and calves by the wild animals mostly by the tigers in the farm and danger posed to the attendants at night, it was essential to maintain and install the street light along the farm road stretching around 800 meters between the milking animal shed and attendant quarters. A total of 10 LED street light (50W) were installed at strategic locations for safety of animals as well as animal attendants during night hours. The existing power supply to the farm area is three phase line, which needs to be converted to single phase using three phase contractors, to overcome the manual switching of street lights, automatic timer will be installed to switch the light at the specific time adjusted in the timer.

j. Animal examination for Reproductive Waste Management

For bringing efficiency in RSH, Wangdigang in terms of animal breeding and reproduction some animals having prolonged Inter-calving period (ICP), as noted by the Norpoen and animal attendants, were presented for gynaecological examination. For examination of animals a wooden crate each was constructed at Wangdigang and Sershong Jangsa for safety of animals as well officials examining and restraining the animals. A total of 14 such animals were examined excluding Jatshams (7 nos) which could not be restrained in the wooden constructed crate. The animals that could be examined were downline of Jatsham; seven milking animals housed at Wangdigang farm and seven dry animals housed at Sershong Jangsa. The animals presented for examination were reported to have more than 18 months ICP. Upon trans-rectal examination, two animals were found pregnant (early pregnancy) and other 12 animals with reproductive disorders of ovarian origin. Mostly, the animals were found to have disorders of ovarian origin such as smooth ovaries indicative of true anoestrus, followed by cystic ovaries of follicular/ luteal type and Persistent Corpus luteum (CL). The animals were advocated with hormonal treatment.

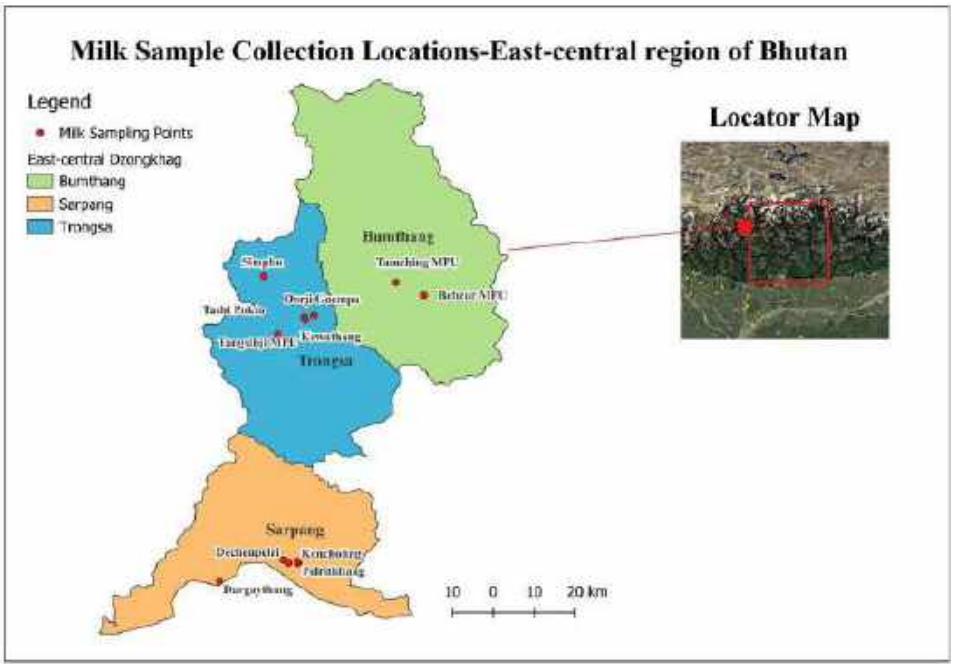
Mostly the animals under milking were found healthy within the body condition score (BCS) of 2-4 on a scale of 1-5.

Dairy Post Production Sector

3 DAIRY POST PRODUCTION SECTOR

3.1 Comprehensive laboratory analyses on raw milk

During the FY 2024-2025, the Post Production Sector conducted comprehensive laboratory analyses on raw milk, focusing on compositional and microbial quality of milk in the East Central regions of the country. The samples were collected over the period of the FY from identified dairy farmers groups in the region as mentioned in the figure below.



A total of 350 samples from Bumthang, 310 samples from Trongsa and 350 samples from Sarpang was assessed for compositional quality while 220 samples from Bumthang, 205 samples from Trongsa and 215 samples from Sarpang was assessed for microbial quality.

Detection of Aflatoxin M1 in random Milk Samples:

A total of 70 randomly collected milk samples were analyzed to determine the presence and concentration of aflatoxin M1, a toxic metabolite of aflatoxin B1 that may be present in milk due to contaminated animal feed. A total of 16 samples (Bumthang), 27 samples (Trongsa), and 27 samples (Sarpang) was assessed and aflatoxin M1 with mean concentrations of 0.086 parts per billion (ppb) (Bumthang), 0.090 ppb (Trongsa), and 0.196 ppb (Sarpang) was detected. Although variations were observed in the levels of aflatoxin M1, all detected concentrations were found to be within the maximum permissible limits established by international food safety authorities such as the Codex Alimentarius Commission (0.5 ppb for fluid milk).

Somatic Cell Count

Analysis on 454 randomly selected milk samples was conducted to determine the level of somatic cell count (SCC), an important indicator of udder health and milk quality. A total of 166 samples (Bumthang), 103 samples (Trongsa), and 185 samples (Sarpang) were assessed with mean SCC values of 373,843 cells/ml (Bumthang), 388,498 cells/ml (Trongsa), and 263,816 cells/ml (Sarpang) being detected. Somatic cell count is widely recognized as a key parameter for monitoring the health status of the mammary gland in dairy animals. Elevated SCC levels are typically associated with mastitis, an inflammation of the udder tissue most commonly caused by bacterial infections. The quantity of SCC needs to be kept under control to ensure the hygienic quality of milk and for food safety.

Raw Milk Compositional quality

A total of 710 milk samples were analyzed for compositional quality of milk. Milk samples from Bumthang, Trongsa, and Sarpang Dzongkhags in the East-Central region were found to be of generally good compositional quality, with most parameters falling within acceptable limits. However, the analysis revealed that the average protein content in milk from all three Dzongkhags was slightly below the international standard, which generally ranges between 3.2% to 3.4% for cow milk as recommended by FAO/WHO Codex Alimentarius and other international dairy benchmarks. Specifically, the average protein levels were 3.13% in Bumthang, 3.12% in Sarpang, and 3.05% in Trongsa. This marginal shortfall may be attributed to factors such as cattle breeds, inadequate protein-rich feeding, stage of lactation, or seasonal variations. On the other hand, the average fat content in the milk was found to be above normal international deviation levels, exceeding the commonly accepted international average of 3.5% to 4.0% fat in raw cow milk. This higher fat concentration is a positive attribute, adding richness and caloric value to milk and making it more suitable for producing high-fat dairy products. The elevated fat content may be influenced by factors like breed characteristics, grazing practices, and feeding systems used in the region.

Sl No	Dzongkhags	Regions	F	SNF	D	P	L	Fr.p	Ash	Added water (%)
1	Bumthang	East-Central Region	5.39	8.60	27.90	3.13	4.74	0.608	0.71	1.10
2	Sarpang		4.42	8.58	28.69	3.11	4.69	0.555	0.68	1.55
3	Trongsa		4.94	8.60	28.30	3.12	4.75	0.560	0.71	0.97
	Total Average		**4.92**	**8.59**	**28.29**	**3.12**	**4.73**	**0.574**	**0.70**	**1.21**

Although the average added water content in milk from Bumthang (1.10%), Trongsa (0.97%), and Sarpang (1.55%) appears low, individual samples show wide variations—ranging up to 53.03% in Bumthang, 24.16% in Trongsa, and 23.33% in Sarpang. This indicates significant adulteration in some cases, likely due to intentional dilution for economic gain. Such practices compromise milk quality, reduce nutritional value, and pose health risks if non-potable water is used.

While the milk quality from the East-Central Dzongkhags is acceptable, particularly in terms of fat content, attention should be given to reducing instances of water adulteration and improving protein levels through better feeding prctices and herd management. This would help align the nutritional profile of milk more closely with international standards and improve its suitability for both local consumption and commercial dairy processing.

Microbial/Pathogens Analysis in milk samples

Total Plate Count

A total of 640 raw milk samples were subjected to microbiological analysis to determine the Total Plate Count (TPC), which serves as a critical indicator of the microbiological quality and hygienic status of milk. The samples were collected from three Dzongkhags: 220 from Bumthang, 205 from Trongsa, and 215 from Sarpang. The results of the analysis revealed mean bacterial counts of 4.33×10^7 colony-forming units per millilitre (cfu/ml) in Bumthang, 7.78×10^7 cfu/ml in Trongsa, and 2.12×10^7 cfu/ml in Sarpang. Total Plate Count is a standard microbiological parameter used to assess the overall bacterial load in milk. High TPC values are generally indicative of poor hygiene during milking, improper handling and storage conditions, or delayed chilling and transportation of milk.

The bacterial counts in raw milk from Bumthang (4.33×10^7 cfu/ml), Trongsa (7.78×10^7 cfu/ml), and Sarpang (2.12×10^7 cfu/ml) are significantly higher than international standards, such as Codex

Alimentarius (≤1×10⁶ cfu/ml), the European Union, United States, and New Zealand (≤1×10⁵ cfu/ml). Compared to these benchmarks, the milk from Bumthang exceeds limits by over 43 times, Trongsa by 78 times, and Sarpang by 21 times, indicating serious lapses in hygiene, handling, and milk cooling practices. These findings highlight the urgent need for improved on-farm sanitation, rapid milk chilling facilities, farmer training, and the establishment of national raw milk standards aligned with global norms to ensure milk safety, public health, and market competitiveness.

i. Coliform Count

A total of 273 raw milk samples from Bumthang, Trongsa, and Sarpang Dzongkhags were analyzed for coliform count to assess milk hygiene. In Bumthang, 94 out of 116 samples (81%) exceeded permissible limits, while Trongsa had 38 out of 52 samples (73%) above the limit. Sarpang showed the highest contamination, with 94 out of 105 samples (89.5%) exceeding acceptable levels.

ii. E coli

A total of 273 milk samples from Bumthang, Trongsa, and Sarpang Dzongkhags were analyzed for E. coli contamination. In Bumthang, 15 out of 116 samples (13%) exceeded permissible limits. Trongsa had 3 out of 52 samples (5.8%) above the limit, while Sarpang recorded 14 out of 105 samples (13.3%) with high E. coli levels.

iii. Salmonella

A total of 93 raw milk samples were analyzed for the presence of Salmonella from Bumthang (23 samples), Trongsa (36 samples), and Sarpang (34 samples). While no Salmonella was detected in samples from Bumthang and Trongsa, 2 samples from Sarpang tested positive for Salmonella in 25 ml of milk, indicating a contamination rate of 5.9%.

iv. S. aureus

A total of 388 raw milk samples were collected from Bumthang (140 samples), Trongsa (88 samples), and Sarpang (160 samples) to assess the presence of Staphylococcus aureus (S. aureus), a common bacterial pathogen associated with mastitis in dairy animals and foodborne illness in humans. The analysis revealed that 19 samples tested positive for S. aureus contamination from Bumthang, with 9 samples from Trongsa and 15 samples from Sarpang showing bacterial presence. The detection in Trongsa, Bumthang and Sarpang suggests possible issues with udder infections, poor hygiene during milking, or improper handling practices.

v. Total Yeast and Mold Count

A total of 121 milk samples from Bumthang, Trongsa, and Sarpang were analyzed for yeast and mold contamination. In Bumthang, 7 out of 25 samples (28%) exceeded permissible limits, while Trongsa recorded a higher contamination rate with 48 out of 62 samples (77.4%) above limits. Sarpang had the highest rate, with 32 out of 34 samples (94%) contaminated. The results underscore the need for improved sanitation, prompt milk cooling, and regular training on hygienic practices.

vi. Antibiotic Residues in milk

A total of 454 milk samples were tested for antibiotic residues, including chloramphenicol, streptomycin, beta-lactams, tetracyclines, ceftiofur, and cephalexin. The results showed that 5 samples contained chloramphenicol, 4 had streptomycin, 4 had beta-lactams, 3 had tetracyclines, 1 had ceftiofur, and 2 had cephalexin. These findings highlight concerns over antibiotic misuse, non-compliance with withdrawal periods, and potential health risks to consumers. This emphasizes the importance of strict monitoring, responsible antibiotic use, and enforcement of food safety regulations in the dairy sector.

3.2 Milk Quality Assessment in Eastern Region

In collaboration with RLDC, Kanglung, the post-production team conducted raw milk quality assessment in the eastern region, as RLDC lacked equipment for key tests (somatic cell count, antibiotic residues, aflatoxin M1, and pathogen detection). These analyses will support the development of a Quality-Based Milk Grading and Payment System. A total of 337 samples from Mongar (110), Trashigang (70), Pema Gatshel (64), Samdrup Jongkhar (63) and Trashi Yangtse (30) were tested for total plate count (TPC), SCC, antibiotic residues, and pathogens, complementing similar assessments done in Western and Central regions earlier in the year.






3.3 Training Activities Conducted in Collaboration with Dzongkhag Livestock Sector

The following capacity-building activities were carried out in collaboration with the respective Dzongkhag Livestock Sectors:

Summary of Training Participants by Location and Activity

Location / Venue	Training Type	Number of Participants	Participant Group	DFG
Wangsisina, Thimphu Dzongkhag	Clean Milk Production	16	Dairy Farmers	-
Tsaluna, Thimphu Dzongkhag	Clean Milk Production	30	Dairy Farmers	Tsaluna Dairy Group
Tselungkha MPU, Haa Dzongkhag	Cheese Processing (Tomme, Gumdel, Caciocavallo)	18	Dairy Farmers (15) and Haa Livestock Sector Staff (3)	1. Esu meri phunsum Om Tshongdrel Detshen 2. Yangthang Om Gongphel Detshen 1. Drading Norlha Detshen 2. Draktshen Norlha Detshen

Sombaykha Dungkhag, Haa Dzongkhag	Clean Milk Production, Yoghurt and Paneer Production	23	Dairy Farmers (Sombaykha and Gakiling Gewogs-18), Sombaykha Dungkhag Officials (3), and Haa Livestock Sector Staff (2)	-

3.4 Assessment and Recommendation for Central Processing Unit (CMPU), Trongsa

As part of the technical support provided during the fiscal year, the NDDC team, led by the Post-Production Sector Head, reviewed the submitted proposal and conducted a site visit to the proposed CMPU at Bjezam, upon the request from the Trongsa DLO. The assessment found the existing structure unsuitable for renovation and recommended new construction in line with the dairy processing standards. The assessment also highlighted infrastructure needs, such as ensuring reliable water supply and proper waste management. A comprehensive report was submitted to the Dzongkhag Livestock Sector, Trongsa and the proprietor to facilitate informed planning.

Dairy Climate Smart Solution Sector (Biogas)

4 DAIRY CLIMATE SMART SOLUTION SECTOR

4.1 Domestic Biogas Unit

Consultation Workshop on Implementation of Sistema.Bio digesters in Eastern Dzongkhags

The NDDC focal supported Bhutan Ecological Society (BES) to host a consultative workshop at Trashigang Dzongkhag from 22 to 23 August 2024. The workshop aimed to bring together stakeholders from the RNR (Renewable Natural Resources) sectors of Eastern Dzongkhags to deliberate on implementing climate-resilient agriculture and livestock farming practices. The goal was to mitigate the impact of climate change and reduce greenhouse gas emissions.

The Department of Livestock is responsible for overseeing the implementation of the Rural Biogas program in the country. In line with this mandate, the BES has recommended the adoption of Sistema. Bio-digesters technology as a sustainable source of green renewable energy for cooking, thereby enhancing waste management and reducing environmental impact.

Feasibility study conducted to construct a 75 m3 biogas plant at Jemithang, Karmaling Gewog under Dagana Dzongkhag

Based on the directives of the Department, the centre has conducted a feasibility study to construct a 75 m3 biogas plant at Jemithang under Karmaling Gewog, Dagana Dzongkhag, from 30th September to 6th October 2024; in collaboration with DLS Dagana. The study aims to assess the feasibility of establishing a 75 m3 biogas plant to generate biogas from pig manure.

Objectives

- Conduct a physical verification of the construction site and available resources.
- Examine the farm location and assess the potential biosecurity measures on the farm.
- Evaluate the purpose of the biogas usage plan on the farm to prevent environmental pollution from excess gas.

General observations by the team

Upon inspection of the construction, it becomes evident that the farm is equipped with five pig sheds designed to house 1000 fattening pigs. Additionally, five poultry sheds are intended to accommodate a capacity of 17,000 broilers.

The Integrated Commercial Pig and Poultry farm is strategically located in a serene environment, away from busy highways and residential areas, ensuring a peaceful setting for the animals. The farm is positioned approximately 8 km from Lhamoizingkha Gewog and 7 km from Karmaling Gewog Centre, allowing for convenient access to these localities while maintaining a tranquil atmosphere for the farm operations.

The farm owner has an innovative plan to utilize biogas produced from pig manure and poultry waste. The biogas will be used to light the animal sheds and cook animal feed, providing a sustainable energy source for the farm. The construction project is nearly 80% complete, with the installation of sheds, drainage systems, chain-link fencing, and an approach road to the farm. In addition, blast freezers and a processing plant for poultry products have been installed on the farm.

The farm is expected to generate an average of 40 cubic meters of biogas daily, sufficient to illuminate all ten sheds. This environmentally friendly approach addresses waste management and provides a practical energy solution for the farm's operations.

The construction work is progressing rapidly, with approximately 80% of the construction already completed. The remaining tasks, such as the installation of drainage systems, construction of round walls, and building of farm labour quarters, are yet to be finished. Additionally, the farm has the potential to accommodate a 100 cubic meter biogas plant instead of the 75 m^3 proposed, based on its capacity and the waste it is expected to produce.

The construction of this farm is a significant and ambitious undertaking, as it is set to become one of the largest commercial farms in the country. Once operational, it will play a crucial role in reducing the country's reliance on imported chicken and pork by nearly 30%. This will not only boost the local economy but also contribute to food security and sustainability. Additionally, the farm's innovative practices and technology will serve as a model for other agricultural ventures, promoting advancements in farming practices nationwide.

Field visits in Paro Dzongkhag, to assess performance of Sistema.bio piloting biogas plants initiated by the Bhutan Ecological Society (BES).

On 11th October 2024, a field visit of piloted Sistema. Bio biogas plants in Lungyni Gewog under Paro Dzongkhag were conducted as a part of the monitoring processes. Against the total installation of four plants, three plants were visited and monitored at Pangbisa and Bondey villages.

General observations

- The required quantity of dung is not fed into the digester.
- Dung and Water ratio are not maintained properly.
- Gas production is optimal in one of the operated plants.
- Initial feeding has been just completed in the plants and started generating gas partly.
- Accessories fittings are not completed in one of the plants.

- One of the users did not apply bio-slurry to the vegetables and crops despite of high nutrient content**.**
- Gas is only used for cooking curry and tea and as such consumption is very minimal. ***(As per the scientific findings, the gas consumption is estimated to be 350 – 400 litres in one hour. For example, from 8 Sistema biodigester the expected gas production may be about 1,800 litres)***

Users' Feed Back

- The Sistema bio-digester seems to be easier to install compared to the fixed dome bio-digester, although cost differences are yet to be known.
- Gas production is reduced during rainy days and winter months.
- One of the users mentioned that the use of LPG gas has been reduced from five cylinders to one since the introduction of the biogas facility.
- Bio-slurry application to vegetables and crops has seen a huge difference in productivity than using undecomposed dung.
- Dung segregation with leaf litter **(mostly pine leaves)** takes a much longer time to feed into the digester which is time-consuming work.
- Other farmers in and around have also shown interest in this technology, however will need more awareness creation programs.
- If the inlet feeding tank could be supported with a bit bigger size than the existing one.

Stakeholders Consultation Workshop on Climate Actions in the Livestock Sector

The Sector has attended the stakeholder consultation workshop on Climate Actions in the Livestock Sector, held in collaboration with FAO Bhutan and the Department of Livestock from November 6th to 8th, 2024, in Paro. The workshop aimed to highlight the necessity of sustainable practices, including improving feed quality, manure management, grazing land restoration, livestock management, and advancing breeding programs. These efforts are essential for reducing emissions while maintaining the sector's benefits for farmers and their livelihoods. This has been aligned with Bhutan's unwavering commitment to carbon neutrality and highlighted those emissions from the livestock sector currently account for 389Gg CO2 emissions.

During the workshop, Ms. Saskia and Mr. Sounvilley, experts from the FAO Head Office in Rome, served as the primary resource officials guiding the sessions. Additionally, Mr. Chado Tenzin, the FAO Representative from Bhutan, along with his team, collaborated with various stakeholders from the Department of Environment and Climate Change, the Department of Forest and Park Services under the Ministry of Environment and Natural Resources (MoENR), the National Centre for Women and Children (NCWC), the Bhutan Trust Fund for Environment Conservation (BTFEC), the Policy

and Planning Division of the Ministry of Agriculture and Livestock (MoAL), and several livestock agencies under the Department of Livestock (DoL) have also attended the workshop.

The following are the Key outcomes anticipated from the workshop;

- Strengthened multi-stakeholder collaboration.
- Enhanced stakeholder capacities to mainstream climate action.
- Assessment of methane and other GHG emissions.
- Development of roadmaps and enhanced measurement, reporting and verification (MRV) systems.

Field visit at Regional Cattle Breeding Centre, Wangkha.

The primary objective of this visit is to carry out a thorough assessment aimed at determining the specific work needed to restore the operational functionality of a 50 cubic meter biodigester, which has been reported as non-operational. This biodigester was constructed during the fiscal year 2015-2016, with funds supported by the Asian Development Bank (ADB) project. As part of the evaluation process, the team will examine its condition, identify any underlying issues contributing to its dysfunction, and outline the necessary steps for effective restoration, to ensure its intended purpose in promoting sustainable waste management and renewable energy production for cooking.

The team has conducted comprehensive field visits to carry out a thorough analysis of the detailed cost implications associated with the operation of the plant. During these evaluations, one critical observation that emerged was the issue of dome leakage, which rendered the plant non-functional. To restore the plant's operational capabilities, it is imperative to conduct specific repair work on the dome.

Furthermore, it was realized that dismantling the dome without the assistance of an excavator machine would present significant challenges for the farm labourers, potentially leading to delays and complications in the repair process. Recognizing this difficulty, the Farm Manager has strongly recommended that the team incorporate cost estimates for hiring an excavator machine in the report. This inclusion will not only facilitate a more expedient repair process but also ensure that the safety and efficiency of the labour force are prioritized.

However, another option to replace with new technology (SISTEMA.BIO) biogas digesters which are initiated by the Bhutan Ecological Society (BES) is also discussed with the farm management. It would benefit those farmers visiting the farm to learn about the Sistema. Bio. Reactors and the benefits gained from the biodigesters.

The Way Forward and Recommendation

The team discussed with the farm officials the potential way forward and recommendations were proposed mentioned below:

- For revitalizing the biogas plant, an estimate should be conducted to fully restore the biodigester dome, which would require demolishing the existing 50-cubic-meter biodigester using heavy machinery.
- A heavy-duty motor is needed for the plant to run the mixture machine while feeding the plant.
- An 8" by 6" shed for the motor is also required to cover the inlet tank.
- The number of user households should be limited to 12 and needs to be redesigned to better match user access points.
- Consider replacing the current system with the new technology (Sistema. bioreactor), based on an analysis of the cost implications for restoration.

Field visit in Chhukha Dzongkhag, along with the SNV team.

The team has visited the bio-slurry farm of Mr Padam Bdr. Ghalley, at Ramitey under Phuentsholing Gewog. Mr Padam said that he has constructed the plant in mid-2011, which might be the first plant in the country. The plant has been running for almost 13 years and still, it is performing well. His main focus is on slurry production but he told us that before the pandemic, his business was very good and now the demand has been drastically reduced. Then the team also visited a few biogas farmers around Ramitey to see the performance of other plants too. The team travelled to Sonamthang Chiwog under Sampheling Gewog and visited around five biogas farmers, as well as small livestock holders who did not have biogas plants. Most of the biogas plants were constructed during the ADB project and are functioning very well. However, a few plants did have minor issues with some of the accessories. The beneficiaries expressed their satisfaction with the biogas, noting that it has allowed them to reduce their use of LPG gas.

The team also visited Gurung Gaon in Sampheling Gewog and conducted a questionnaire survey. This survey explored how residents benefit from the biogas plant and gathered their feedback on whether the biogas program should be expanded. Regarding farmers who do not have biogas systems, they mentioned that labour shortages make it challenging to care for a large number of cattle and to install biogas plants. Before the COVID-19 pandemic, they would hire day labourers from nearby Indian towns, but now it is difficult to find labour, and the costs have increased significantly.

Piloting and Demonstration Program

In 2024, the BES had installed twenty units of Sistema.Bio hybrid reactors as a pilot program in the Western region. Recently, an additional five units of Sistema.Bio hybrid reactors were piloted in the Eastern region and one more unit at Gasetshogom Gewog under Wangdue Phodrang Dzongkhag. This expanded initiative serves not only to evaluate the performance and efficiency of Sistema.Bio reactors across various agroecological zones but also to gather vital data that will inform further scaling of the program.

Testing these innovative reactors in diverse agricultural environments, it aims to optimize their functionality and effectiveness in promoting sustainable rural biogas initiatives throughout the region. This comprehensive assessment is a critical step toward enhancing the overall impact of the biogas program and ensuring that it benefits our rural communities. The details of the piloting plants installed are mentioned in the table below.

Sl	Dzongkhag	Gewog	Plant size	No. of plants installed
1	Chhukha	Darla	Sistema 8	1
2	Paro	Lungyni	Sistema 8 & 12	4
3	Thimphu	Mewang	Sistema 8	1
4	Punakha	Barp/Toepisa/Kabesa	Sistema 8 & 12	11
5	Wangdue Phodrang	Gasetshogom	Sistema 8 &12	4
6	Mongar	Chali	Sistema 8	1
7	Trashigang	Udzorong	Sistema 6	1
8	Pema Gatshel	Shumer & Norbugang	Sistema 6	2
9	Samdrup Jongkhar	Dewathang	Sistema 8	1
	Total			**26**

In conjunction with the piloting program, local communities in the surrounding areas were also invited to participate and learn more about the initiative. During these sessions, they received comprehensive

briefings on the various benefits offered by Sistema.bio reactors. These reactors are designed to improve waste management and provide sustainable energy solutions, and the attendees were informed about how they could positively impact both their households and the environment. The program emphasized the importance of community engagement, highlighting how the adoption of these systems could lead to reduced waste, enhanced agricultural productivity through the use of organic fertilizer produced by the reactors, and ultimately contribute to healthier living conditions.

Current scenario of the Piloting SISTEMA.Bio reactors.

Based on our recent field visits conducted by the BES Office in partnership with the NDDC's Biogas Unit, we have observed promising performance regarding the SISTEMA.Bio reactors were installed in 2024. These reactors have started gas production and are receiving positive feedback from the beneficiaries, indicating that they are effectively meeting the needs of their users.

The SISTEMA.Bio hybrid reactors, which were piloted in January 2025, have not yet initiated gas production. This issue is particularly noticeable in colder regions where these reactors have been installed, suggesting that environmental conditions may be influencing their performance. We are actively investigating these factors to understand the underlying causes and identify potential solutions to enhance their operational efficiency.

Local Stakeholder Consultation Meeting

The Local Stakeholder Consultation Meeting was held in five strategically chosen locations, ensuring that all 20 Dzongkhags and 205 Gewogs were effectively represented. This inclusive approach facilitated widespread participation and reinforced the commitment to fostering collaboration and community engagement throughout the region. The detailed venue for the meeting and the participants is mentioned in the table below.

Meeting Date	Venue	Dzongkhags	Total participants
21/01/2025	Old DT Hall, Mongar Dzongkhag	Lhuentse/Trashiyangtse/ Mongar	112 heads
24/01/2025	SJ Central School, Samdrup Jongkhar	Trashigang/Pema Gatshel/ Samdrup Jongkhar	110 heads

29/01/2025	Namgay Heritage Hotel, Thimphu	Samtse/Chhukha/Haa/Paro/ Thimphu	160 heads
10/02/2025	PDC, Tsirang	Gasa/Punakha/Wangdue/Dagana/ Sarpang & Tsirang	210 heads
18/02/2025	Phuntsho Guest House, Bumthang	Zhemgang/Trongsa and Bumthang	55 heads

The meeting brought together an impressive array of local leaders, including Gups, who are the elected heads of local government. Their involvement was crucial for bridging the gap between community needs and policy implementation. The presence of representatives from the Dzongkhag Livestock and Agriculture Sectors emphasized the importance of interdepartmental cooperation in addressing the challenges faced by each locality.

Moreover, Gewog Livestock Extension Supervisors and Gewog Agriculture Extension Supervisors contributed their specialized knowledge, offering insights into best practices and innovative strategies relevant to local conditions. The involvement of the Chairman of the Dairy Farmers' Group was important, as it ensured that the concerned dairy group members would take part in the Sistema biogas program, which is one of the probable intentions for enhancing upscaling and promotion of the biogas sector.

During the consultation meeting with stakeholders, it was agreed that the BES would implement a total of 10,000 units of SISTEMA.Bio hybrid reactors within the next two years in a closed collaboration with the Department of Livestock, Dzongkhag Livestock Sector and Local Governance. The BES will provide a variety of SISTEMA.BIO reactor sizes, like Sistema 6, 8, 12, and 16, to meet the specific needs based on the potential yield and adequate volume of the feed stock from their respective dairy farms.

To avail of this facility, the farmers will be required to pay a nominal registration fee of ngultrum five thousand upon the installation of the biogas reactors. The BES has also committed to providing a comprehensive warranty of ten years for the reactors, along with a one-year warranty for the associated

accessories. During this warranty period, the BES will be obliged to carry out necessary repair and maintenance services without any charges to the farmers. After the warranty period expires, a minimal fee of Ngultrum five hundred will be charged for any repair services.

To further support the farmers, the BES has assured that all required accessories will be readily supplied as needed, ensuring continuous operation and maintenance of the SISTEMA.Bio reactors. The tentative dateline for the launching and implementation of Sistema.Bio hybrid reactors shall be commenced from April 2025

Recommendation and Way forward

The following are some of the issues and concerns raised by the local leaders and the field officials related to the biogas program and livestock developmental activities.

- Concerns have been expressed by local leaders regarding the current guidelines for the Cost Sharing Mechanism (CSM), which is now set at a 60:40 ratio. They highlighted that the government has revised the subsidy structure from 70:30 to 60:40, making it less affordable for our struggling farmers. The leaders have urged the Department of Livestock to inform the government about the importance of maintaining the previous subsidy ratio to support those in need.
- Local leaders have requested the Department of Livestock to manage and provide jersey crossbred cows and heifers from the Government Livestock Farms through a Cost-sharing mechanism. Their goal is to reduce the population of unproductive cattle and promote the breeding of high-quality cattle. To this, the local leaders were informed and sensitized about the Elite Heifer Breeding Scheme (EHBS) initiated by NDDC in Yusipang. The participants were also informed about the importing of sex-sorted semen and supplying it free of cost to enhance the quality of cattle breeds and increase milk production.
- Participants expressed concerns regarding the non-functional issues associated with conventional fixed dome biodigesters. Approximately 19% of the installed biogas plants are currently dysfunctional. It has been learnt that these issues primarily result from user errors and minor defects in the pipelines and related accessories. Attendees were advised to submit reports of non-functional cases to the Biogas Unit under the NDDC. The NDDC will address the repair and maintenance of all malfunctioning units in the fiscal year 2025-2026, contingent upon budget approval.
- In the way forward: The Bhutan Ecological Society has committed to collaborate with Gewog livestock extension supervisors and the support staff of the Biogas Unit under the NDDC during the hands-on training and support for the installation and maintenance of Sistema.Bio reactors, enabling teams to manage biogas activities independently in the field.

In conclusion, this consultation meeting served as an essential forum for discussion and knowledge exchange, nurturing a spirit of collaboration among stakeholders. It provided a valuable opportunity for participants to share experiences, identify common challenges, and explore potential solutions aimed at enhancing the promotion of SISTEMA.Bio hybrid reactors and the 10+ Million Trees Plantation Project initiated by the Bhutan Ecological Society (BES). The collective input from such a diverse group of attendees not only improved the discussions but also laid the foundation for future initiatives that will benefit local communities and strengthen the project activities across the Dzongkhags and Gewogs.

Lastly, on behalf of the National Dairy Development Centre and the Department of Livestock as a whole, we would like to express our gratitude to the Project Director of the Bhutan Rural Biogas Initiatives, along with the Bhutan Ecological Society and its management. The BES's commitment to financial support will be instrumental in sustaining the momentum of biogas promotion in our country.

This initiative not only serves to benefit our rural communities by providing clean energy for cooking but also plays a crucial role in advancing environmental sustainability and improving the livelihood of our rural communities. Your commitment to this cause is truly commendable, and we are hopeful for the positive impact it will have for generations to come.

Training on a database system for online registration for installing SISTEMA.Bio reactors.

- Short training courses on database systems were conducted for 20 Dzongkhag Livestock Sector officials. This initiative aims to facilitate the seamless registration of potential dairy farmers for the installation of Sistema.bio hybrid reactors.
- Detailed insights into the technical parameters of SISTEMA biogas technology were presented, which would enhance their efforts in conducting a sensitization program for farmers.

They were also informed about the domestic biogas programs outlined in the 13th Five-Year Plan and the financial support from various other projects, including the Impact project, the World

Dairy Information Management Sector

5 DAIRY INFORMATION MANAGEMENT SECTOR

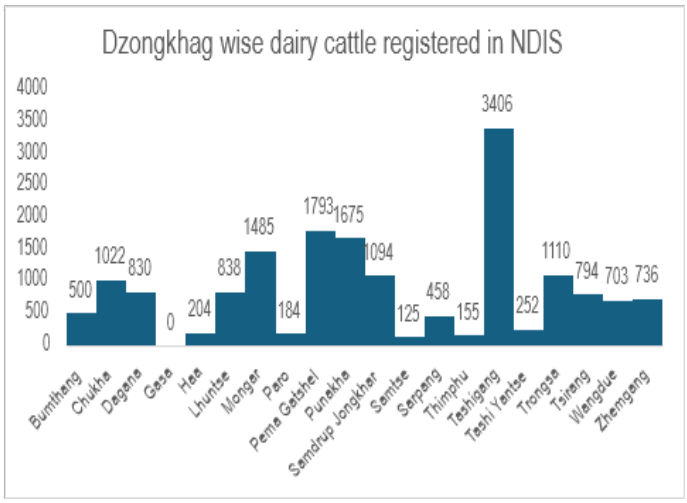
5.1 National Dairy Information System

Given the transformation of the animal identification and recording system, the centre initiated the development of an online web-based National Dairy Information System (NDIS). This system records all dairy development activities through real-time data capturing and reporting. It will connect livestock officials engaged in dairy production with farmers or Dairy Farmers Groups/cooperatives, processors, and decision-makers through a centralized platform of NDIS.

During the Elite Herd Breeding Scheme program carried out in Trongsa & Bumthang Dzongkhags during May & June 2025, a refresher course on NDIS usage was imparted. Some of the local leaders also attended the awareness program and were impressed with the system being put in place. The local leaders committed their full support as the dzongkhags are a dairy priority area and farmers rear a good number of improved cattle. During the highland training program at NDDC Yusipang, NDIS awareness program was given to Gewog officials of highland Dzongkhags. A total of 1000 ear tag were printed and issued for ear tagging of selected Yaks during the months of May and June 2025.

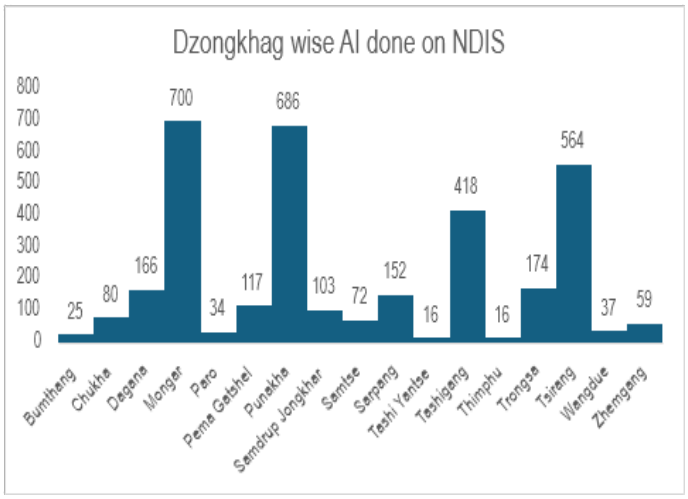
Dzongkhag-wise animal registration status

As of June 2025, the National Dairy Identification System (NDIS) has been implemented across all Dzongkhags except Gasa. A total of 17,364 cattle was registered online and identified via ear tagging, with information accessible online. Trashigang has the highest number of ear-tagged cattle (3,407), followed by Pema Gatshel (1,793) and Punakha (1,675) Dzongkhags. This indicates a significant step towards the digitalization of dairy cattle registration. The details of cattle registered in the National Dairy Information System online system are depicted below;



Artificial Insemination Recorded in NDIS

A total of 3419 numbers of artificial insemination (AI) reports were generated from the National Dairy Information System as of June 2025. Mongar recorded the highest with 700 numbers of AI, Punakha recorded the second highest with 686 numbers of AI, and Tsirang recorded the third highest with 564 numbers of AI,



Support to Dzongkhag

Facilitated the purchase of plastic ear tags, ear tag applicators, and tag pens from the NDDC tendering process. Based on the quotation from NDDC, about 20000 plastic ear tags were purchased by Dzongkhag, from which 10000 plastic ear tags were laser printed and supplied to Bumthang, Trongsa, Mongar, Sarpang, and Punakha Dzongkhags. This is a big move from the region and Dzongkhags, as all these NDIS items were either purchased from regional projects or the respective Dzongkhag budget. In the past all the ear tag, ear tag applicators and Tag pen were purchased and distributed from NDDC, Yusipang.

Ear tagging programs in farmers' fields are forthcoming because farmers recognize the numerous benefits of ear tagging, including improved herd management, traceability, and potential for increased productivity and profitability. Ear tags provide unique identification, facilitating record-keeping and data collection on individual animals.

National Dairy Information System enhancement

To enhance the National Dairy Information System (NDIS), a comprehensive Business Requirements Document (BRD) is needed to improve data quality, accessibility, and incorporate the Yak Information System. The BRD documents is being developed through a consultative process involving officials from relevant stakeholders, ensuring the upgraded system meets the needs of all end-users.

5.2 Knowledge Management, Monitoring and Reporting Unit

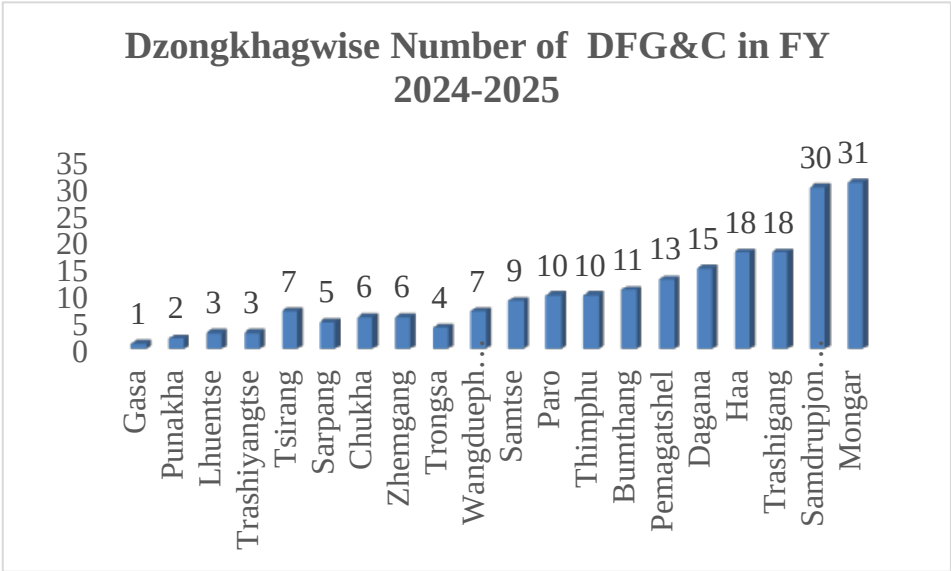
Online consolidated data from Dzongkhag_ Dairy Group and Cooperative Products

During the FY 2024–2025, the unit actively carried out monitoring and reporting to ensure effective knowledge management of dairy-related data received online from all 20 Dzongkhags. Emphasis was

placed on ensuring data accuracy, consistency with the prescribed format, and timely reporting. Monthly submissions covering key production parameters from each dairy group and cooperative were meticulously compiled, tabulated, analyzed, and consolidated into a comprehensive report, forming a critical input for decision-making and strategic planning in the dairy sector.

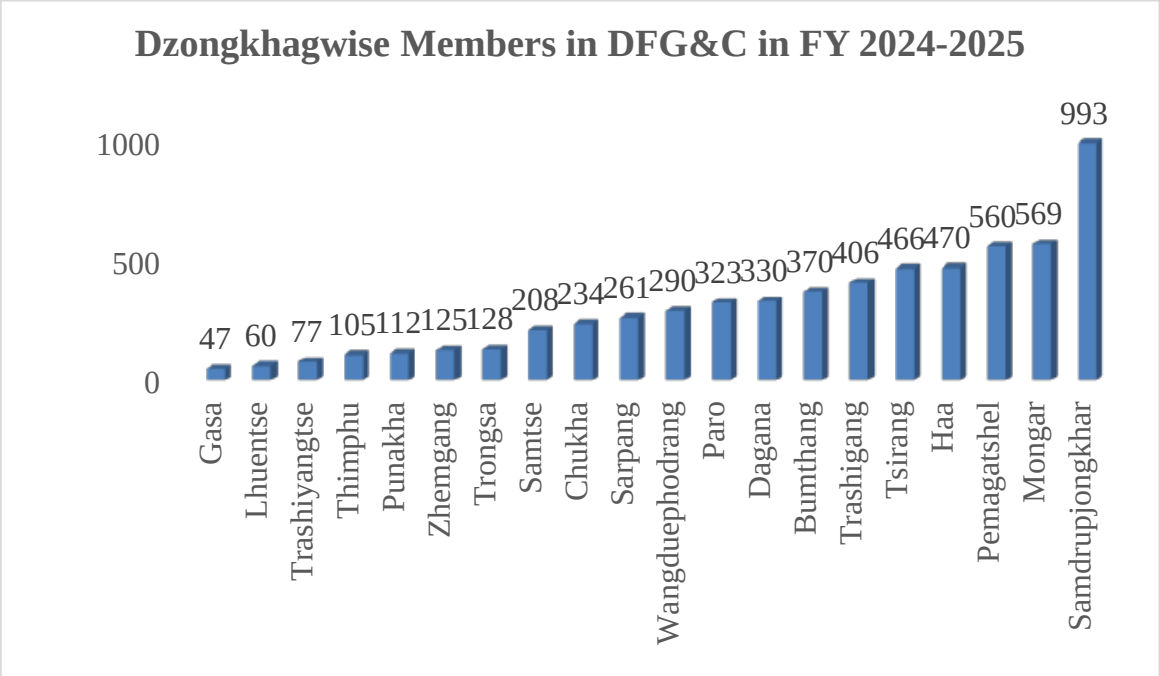
Number of DFG&C in 2024–2025

The chart illustrates the distribution of Dairy Farmers Groups and Cooperatives (DFG&C) across all 20 Dzongkhags for the FY 2024–2025. A total of 209 DFG&C was recorded nationwide of which 199 are functional and rest are non-functional due to some logistical reasons such as maintenance of infrastructure, reflecting active engagement in dairy institutional development. The data underscores the need for targeted capacity-building and resource allocation in underperforming Dzongkhags while continuing to scale up successes in high-performing regions to achieve balanced national growth in the dairy sector.



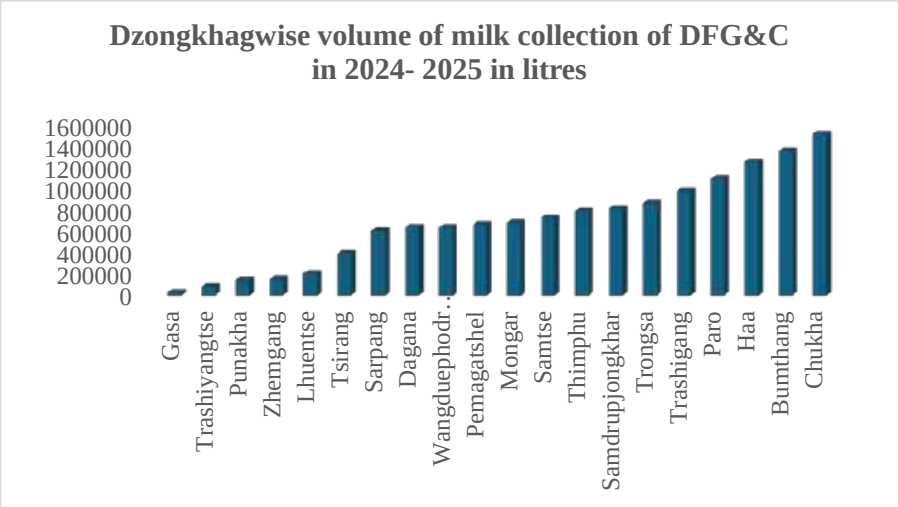
Number of members in DFG&C for FY 2024–2025

At the end of the FY, in 209 DFG&C there a total of 6134 members averaging at 29.18. The figure below illustrates the distribution of members in DFG&C across all 20 Dzongkhags for the FY 2024–2025.



Milk collection by the Dairy Groups and Cooperatives

During the FY, DFG&C across the country collected a total of 13,786,065.13 liters of milk, equivalent to 13,786 metric tons. The figure below presents the total volume of milk collected by Dairy Farmers Groups and Cooperatives (DFG&C) across all 20 Dzongkhags during the fiscal year 2024–2025. The data highlights considerable variation in milk collection, indicating differing levels of dairy productivity, organizational efficiency, and market access across the regions. The data suggests that Dzongkhags with stronger institutional frameworks, better access to dairy infrastructure, and organized marketing systems are achieving higher milk collection. Dzongkhags with lower performance may benefit from targeted interventions such as breed improvement, enhanced input supply, training and capacity building, and improved access to markets and processing facilities.

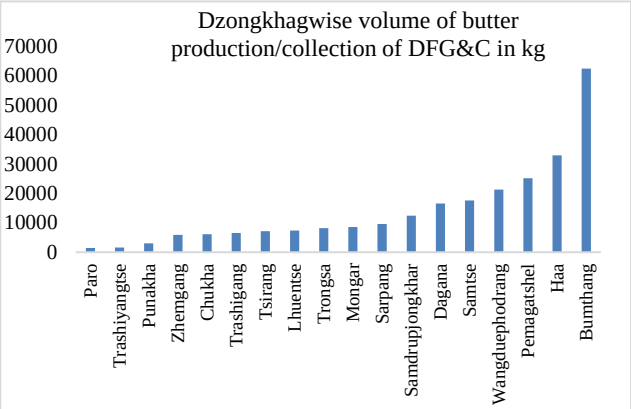


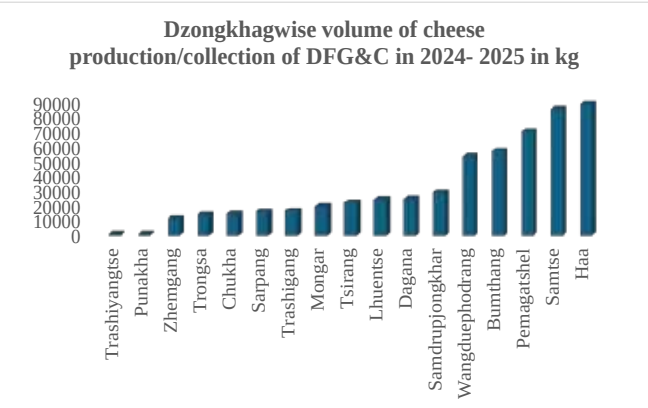
Butter processing or collection by the Dairy Groups and Cooperatives

The DFG&C either produce butter within their Milk Processing Units (MPUs) or individual member process at home and supply to aggregators who further sells in the town. During the FY, a total of 252,559.2 kg (252.56 MT) of butter was processed or collected by the DFG&C across the country.

Cheese processing or collection by the Dairy Groups and Cooperatives

The DFG&C either produce cheese within their Milk Processing Units (MPUs) or individual member process at home and supply to aggregators who further sells in the town. During the FY, a total of 553,139.58kg (553.14 MT) of cheese was processed or collected by the DFG&C across the country.

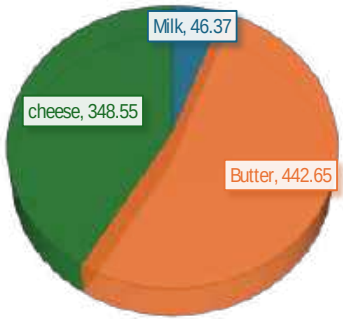




Farm gate price of milk and milk products

During the FY, the average farm gate price of milk, butter and cottage cheese are Nu 46.37/l, and 442.65/kg and 348.55/kg respectively.

FGP OF MILK, BUTTER AND CHEESE OF DFG&C IN 2024-2025 IN NU



Consolidated Online Reporting -Dairy Input farms

The unit monitored reporting of online data by the Government cattle farms (RCBC, NCBC, NMBC) and NDDC primarily on herd dynamics, milk production, revenue generation, production and supply of inputs. Besides ensuring compliance to data accuracy and frequency of reporting, monthly data was compiled and reported in quarterly reports of the Centre adhering to the prescribed format.

Quarterly and Annual Progress Report Preparation

The unit diligently collected and compiled reports of all the sectors and prepared the quarterly and annual progress report for the FY of the Centre. Additionally, collected and compiled reports of all the sectors and prepared the key achievement report for the Centre for onward submission to Prime Minister's Office.

Website and Social Media Administration

During the fiscal year 2024–2025, the Centre maintained an active presence on its official website www.ndrdc.gov.bt and social media platforms as part of its institutional knowledge dissemination and stakeholder engagement strategy. As the designated administrator, regular updates were carried out to ensure timely communication of key activities, announcements, and achievements.

Significant posts included events such as staff movements, promotion, resignations, etc. Such updates were aimed at reinforcing internal cohesion and public visibility of the Centre's mandates.

The use of digital platforms has enhanced transparency, improved outreach to relevant stakeholders, and contributed to building greater awareness around dairy sector programs and interventions.

Publications

- Dairy commercialization in mountain farming environment of Bumthang district: Prospects and Challenges, *Bhutan Journal of Animal Science, 2025;* authored by Nar B Tamang and Aita K Bhujel
- Microbiological Quality of Raw Milk in the Western and West-Central Region has been submitted to *Bhutan Journal of Animal Science (BJAS);* authored by Karma T Lhaden, Phuntsho T Norbu, Sonam Zangmo and Sonam Thinley
- Performances of Tropical Holstein Friesian (*Bos taurus*) x Thrabam (*Bos indicus*), F1 daughters managed under Bhutanese farming environment, paper published in *SAARC Journal of Agriculture 22* (1): 235-242 (2024), DOI: https://doi.org/10.3329/sja.v22i1.69807; authored by Nar B Tamang, Dhan B Rai, Abi N Koirala and Aita K Bhujel
- Brokering from the Farm to the Shop – *Improving Connections Between Formal and Informal Actors in the Dairy Value Chain in Bhutan*. https://doi.org/10.18174/677385; authored by Aita K Bhujel and Thies Reemer (eds.)

Publication under process

- A manuscript titled *"Review of Breeding bull supply mechanism, Management system and Performances in West-central and East-central regions of Bhutan"* is submitted for publication in the forthcoming issue of BJAS; authored by Dhan B Rai, Aita K Bhujel and Abi N Koirala

- Assessment of Milk Composition in Dairy Farmers Groups of the West and West-Central Region compiled and completed
- Assessment of Aflatoxin M1 and Antibiotic Residues in Imported Tetrapack Milk and Raw Milk has been compiled and completed

Review of Manuscripts for publication in BJAS

As a Researcher and editor of the Bhutan Journal of Animal Science (BJAS), carried out the review of the following manuscripts in 2024-25 for publication in forth coming BJAS issue.

- Surgical Management of Cranium Bifidum with Meningocele in a Jersey Calf Under Resource-Limited Settings: A Retrospective Case Report.
- Assessment of Animal Welfare, Slaughter practices and Food safety in Bhutan.
- Available grazing resources for yaks and Zo/Zom in Merak and Sakten blocks, Trashigang district
- Quantification of Butter and Cheese Yield from milk from different breed of cattle
- Assessment of animal slaughter practices, food safety and welfare in Bhutan
- Assessment of Milk Composition in the Dairy Farmers Group of West and West Central Region

Package of Practices

The following package of practices were prepared and softcopy uploaded in the centre's website www.ndrdc.gov.bt and hard copy was printed in booklet form and distributed to all sectors.

i. Analysis of Gender Engagement in Dairy Farming in Bhutan

Context:
Dairy farming in Bhutan is vital for rural development, poverty reduction, and employment. Despite progress, achieving sustainable growth demands a deeper understanding of gender roles. This study utilized the "Gender Roles Framework" to assess men's and women's engagement across four diverse regions.

Key Findings:
- **Roles and Participation:** Women are significantly more involved in daily dairy farming activities like milking, feeding, dung removal, and community events, while men handle tasks such as shed maintenance and animal treatment.
- **Resource Control:** Women had greater access and control over resources like livestock, land, household property, and subsidies.
- **Constraints:** Women face heavy workloads, limited training opportunities, childcare responsibilities, and restricted access to technology.

Recommended Practices:
- Introduce gender-friendly tools and equipment.
- Deliver accessible and tailored training programs for women.
- Promote shared decision-making and labor within households.
- Incorporate sex-disaggregated data into planning and policy design.

ii. Performances of Tropical Holstein Friesian (THF) × Thrabam F1 Daughters

Context:
To improve milk yield and genetic potential, THF semen was introduced via AI to local Thrabam cows starting in 2017.

Key Findings:
- AI Success Rate: Higher in natural heat (37.1%) than induced heat (18.1%).
- Milk Yield: F1 daughters yielded 5.2±2.5 L/day on average, with first lactation yields estimated at 1576 L.
- Reproductive Performance: Age at first calving was 37.2±9.8 months, deemed satisfactory.
- Adaptability: Minimal calf mortality (2.95%) and no adult mortality suggest good adaptability under Bhutanese conditions.

Recommended Practices:
- Prefer natural heat over induced heat for AI.
- Avoid mating heifers before attaining two-thirds of adult body weight.
- Improve feeding and management practices as THF inheritance increases.

iii. Factors Influencing Effective AI Services Delivery

Context:
Although Bhutan's national AI program has grown since 1987, AI coverage remains low (12%). Study across 5 districts examined factors influencing effectiveness.

Key Findings:
- District Performance: Tsirang had highest AI rate and success (44.5%). Dagana had the lowest.
- Limiting Factors: Major limitations include farmer awareness (42%), animal-related issues (31%), technician capability (15%), and semen quality (12%).
- Challenges: Include logistics, multitasking of extension staff, and poor record-keeping.

Recommended Practices:
- Provide regular refresher courses for AI technicians.
- Engage retired and community AI technicians (CAITs).
- Promote farmer awareness on AI benefits.
- Cluster underperforming AI centres with well-performing centres to optimize resources.

iv. Why Brokers Are Important in the Dairy Value Chain

Context:
While informal brokers are often viewed negatively, they play a critical role in linking producers and markets, particularly in remote areas.

Key Findings:
- Brokers support both formal and informal value chains, especially where Dairy Farmers' Groups (DFGs) face marketing challenges.
- Overlooking brokers may limit commercialization and reduce income for smallholders.
- Need to balance support for subsistence and commercial dairy farming.

Recommended Practices:
- Formal pathways: Ensure seamless delivery of inputs and fair pricing policies.

- Informal pathways: Empower groups to process/market milk independently or negotiate transparently with brokers.
- Strengthen marketing through multi-stakeholder partnerships, digital platforms, and DAMC-led business support.

Institutional visit to India (15-21 April 2025)

Participated in the institutional visit to Gujarat and New Delhi, India from 15-21 April 2025 of eight-member Bhutanese delegation, led by the Hon'ble Secretary, MoAL. The primary purpose of the visit was to discuss with the Department of Animal Husbandry and Dairying (DAHD), New Delhi and National Dairy Development Board (NDDB), Anand, Gujarat on the proposal to import 200 pureline Jersey heifers during 13FYP through GoI assisted PTA project in Livestock Sector. The visit also explored the opportunities for technical cooperation with DAHD/NDDB on exchange of livestock germplasm (Jersey, Yak, Mithun, Buffalo, Poultry, Fishery and Piggery), animal health particularly addressing transboundary animal disease (TAD), animal feed and nutrition, cooperatives, value addition/processing, capacity building and institutional linkages. The delegation visited the NDDB headquarter and subsidiaries like IDMC, NDDB CALF Ltd, Genomic Lab, OPU-IVF Lab amongst others. The delegation also visited AMUL, Mother Dairy and ICAR-Institute of Agriculture Research Institute at New Delhi.

The visit to the NDDB in Anand, Gujarat and the DAHD in Delhi proved highly fruitful, laying a strong foundation for future collaboration in dairy and livestock development in the country. Key outcomes included agreements on the procurement of high-quality Pureline jersey cattle through NDDB-NDS, as well as training and technical partnerships with renowned institutions like AMUL, IDMC Ltd, CALF Ltd, Mother Dairy and many more including IARI. Furthermore, discussions extended to the procurement of diverse germplasm, including poultry, Mithun bull, fishery broodstock, and piggery parent stock, to enhance genetic resources in Bhutan. Significantly, AMUL and Mother Dairy experts have agreed to visit Bhutan to study Bhutanese systems and provide tailored recommendations, marking a major step toward transforming our dairy and livestock sectors to match international standards. Bhutan will also receive specialized training in post-production dairy equipment maintenance and services. The visit also provided valuable insights into the advanced work being carried out at the Animal Genomic Lab under NDDB, which plays a crucial role in genetic improvement and disease resistance in livestock. Discussions also focused on fodder germplasm supply, TMR technology, human resource development, strengthening animal health services through cross-border disease control. Both sides agreed to expedite the signing of an umbrella MoU already cleared by the GoI cabinet, which will allow for subsidiary agreements in specific areas such as dairy and research. Plans were also made for phased procurement of germplasm by July-August 2025-26, exchange visits for professionals, and NDDB's support in developing Bhutan's dairy and aquaculture value chains. Regular coordination meetings under TAD info were also agreed upon to maintain momentum in these collaborative efforts.

Workshops/ meetings attended

- Attended two-day Bovine Tuberculosis Risk Assessment workshop from 30-31 October 2024 at Paro, organized by National Centre for Animal Health, under the DoL in collaboration with the Khesar Gyalpo University of Medical Sciences of Bhutan and the University of Melbourne, Australia.
- Participated in the Regional Consultation Workshop for Bhutan's fifth National Biodiversity Strategies and Action Plan (NBSAP) from 3-5 Feb. 2025 at Tashi Namgay Resort, Paro, organized by the National Biodiversity Centre under MoAL.

- Attended a three-day Stakeholder Consulation workshop in Paro from 6-8 Nov. 2024 on national climate action in the Livestock Production system in Bhutan organized by the DoL with technical support from the FAO, Bhutan.
- Attended Refresher training of field Veterinary Paraprofessionals as Resource Person from the NDDC, Yusipang, organized by the NCAH under the DoL from 6-11 Jan. 2025 (1st cohort) at hotel Palm, Phumtsholing, from 24-29 Mar. 2024-25 (2nd cohort) and from 31 March – 05 April 2025 (3rd cohort) at Gold Fish Resort, Gelephu.
- As a Focal point for BRESCA project from the DoL, attended a day long Technical Working Group meeting on 13 Mar.2025 at hotel Nordenma, Babesa, Thimphu, organized by the PMU, BRECSA project, and a Stakeholder engagement workshop from 27-28 March 2025 at hotel Yangtsholing Tara, Gelephu.
- Meetings on World Bank RNR Job project and IFAD IMPACT project preparation
    - Two Specialists of NDDC represented the Department of Livestock as full time Task force member for *RNR Job Project funded by World Bank.* The World Bank has offered a project worth US 34.5Million for financing a RNR Job Project for Ministry of Agriculture and Livestock and Ministry of Energy and Natural Resources for selected commodities: Dairy, Potato, Citrus, and Timber from July 2025 to June 2030. The Specialists of NDDC attended several rounds of meetings/workshops to design and frame project activities with costing and other details required. Project finally is Approved by World Bank Board of Director for implementation from July 2025.
    - NDDC Specialists also served as the full time task force member for project design and finalization for IFAD funded *Inclusive Markets, Production, Agricultural Commercialization and Transformation (IMPACT)* project for six eastern and Bumthang Dzongkhag worth USD 12 Million aimed at Dairy Commercialization and Transformation in along with other agricultural commodities.Task force members attended several technical meeting convened with key stakeholders by IFAD/ PPD MoAL along with members from other departments between 24 April and 9 May 2025.
- Meeting to develop Standard Operating Procedure and Work plan for Waghu cattle X Yak hybridization
- Attended meeting to facilitate developing of Standard Operating Procedure and Work plan for Waghu cattle X Yak hybridization 3-4 Feb 2025 at National Livestock Research Centre, Bumthang
- Attended meeting of Subcommittee on Sanitary and Phyto-Sanitary aspects for Free Trade Agreement between Bhutan and Thailand from 27-28 January 2025 organised by BFDA
- Meeting on revised research framework and implementation plan for interspecies hybridization of Yak and Wagyu cattle at Wangdue 16-18 April 2025
- Attended Standards and Trade Development Facilitation Meeting Organised by SDTF coordination office and BFDA Thimphu, 14 May 2025 as dept representative
- Attended Dairy Practitioner Engagement workshop held at Wangdue from 27-28 May 2025 as resource person
- Attended Dairy Strategic Investment Plan (SIP) Development Workshop for implementation of dairy value chain in Trongsa Dzongkha under the BRECSA project from 18-20 May 2025.

- Participated in the stakeholder engangement and workshop facilitation for state land leasing module under the state land management system development initiative organized by National Land Commission Secretariat at Paro from 23 April to 1 May 2025
- Participated in the Consultative Workshop for Project Concept Development from September 16 to 20, 2024, organized by the Ministry of Energy and Natural Resources in collaboration with WWF Bhutan.
- Participated in 2nd National Livestock Research Coordination Workshop-presentation of published research article CoP-milk, at Palm hotel in Phuntsholing from 9 to 10th January 2025 organized by National Livestock Research Centre.
- Attended 3day training workshop on Farm Economics – Cost of Production 14 – 16 April 2025 at Kingaling Hotel, Lobtshokana, Punakha organized by Department of Livestock.
- Attended 4day workshop as alternate focal from 25 – 29 March 2025 at ShomoChuki hotel in Paro on service inventory validation organized by Public Service Delivery Department (PSDD) under Prime Minister' Office.
- Attended 2day workshop on developing the Sub-National Vulnerability Index through a Multi-stakeholder Participatory Approach from 10-20 May 2025 at Thimphu Deluxe, organized by Department of Local Governance and Disaster Management, funded by World Bank.
- Attended 4 days training workshop on Green House Gas (GHG) inventory for the livestock sector from 13-16 June 2025 at Metta Resort and Spa in Paro, organised by Department of Livestcok funded through Capacity Building Initiatie for Transparancy (CBIT) project.

Administration and Finance Sector

6 ADMINISTRATION AND FINANCE SECTOR

Annual Asset declaration for the Year 2024

All the covered persons have declared the asset for the FY as per the time specified as indicated below.

Sl. No.	Cover person	Designation	CID no	Remarks
1	Dr. Dorji	Specialist III	11409000164	Annual declaration declared
2	Dr. N.B Tamang	Specialist I	11805000193	Annual declaration declared
3	Dr. Dhan Bdr. Rai	Specialist II	11303003331	Annual declaration declared
4	Jigme Wangdi	Specialist II	10904003438	Annual declaration declared
5	Phuntsho Tobgyel Norbu	Specialist III	10203004345	Annual declaration declared
6	Lokey Thapa	Dy. Chief LPO	11215005775	Annual declaration declared
7	Deki Choden	Dy. Chief LPO	11405000794	Annual declaration declared
8	Aita Kumar Bhujel	Dy. Chief LPO	11208003866	Annual declaration declared
9	Thinley Dorji	Sr. LPO	11703000975	EoL
10	Karma Tshering Lhaden	LPO	11312002278	Annual declaration declared
11	Sonam Zangmo	Sr. LPO	11704002479	Annual declaration declared
12	Sonam Thinley	Dairy Officer	11106004806	Annual declaration declared
13	Sonam Phuntsho	Sr. LS	10710001144	Annual declaration declared
14	Abi Narayan Koirala	Sr. LPS I	11805000963	Annual declaration declared
15	Sangay Wangmo	Sr. LS II	11601003186	Annual declaration declared
16	Sangay Tshering	Sr. LS III	12005002379	Annual declaration declared
17	Thukten Dorji	Sr. LHS	10903001068	Vacation of office declared
18	Indra Bdr Raika	Sr. Technician I	11810002916	Annual declaration declared
19	Pema Dorji	Sr. Adm. Asst. V	10716000255	Annual declaration declared
20	Tshewang Lhamo	Jr. Engineer	11513003106	Assumption of Office
21	Nima	Sr. Lab Asst V	10104001129	Annual declaration declared

Annual eGP Tendering

During the FY 2024-2025, the total annual eGP tendering floated by the center were 11 tenders that includes 7 tenders for capital works (OTM), 1 tender for animal feeds supply (OTM), 1 tender for annual maintenance of vehicle (OTM), and 2 tenders for lab consumable and supply of tools and equipment (LTM).

Uploading of bills/invoice/advances in FINDOC

During this FY, 300 bills/invoice/advances were uploaded in FINDOC under cluster finance service system for settlement and payment of the bills and invoices.

Uploading of Office orders in eDATS

Uploaded 190 office orders for travel claim by the officials and staffs of the center during the financial years enabling the processing of travel claims in the eDATS.

Recipients of lifetime service medal

1) Mr. Kanti Ram Chhetri
2) Mr. Abi Narayan Koirala

Staff Promotion

List of staff promoted to their next Higher Grade/Level for the FY-2024-2025 are indicated below:

Sl. No	Name	From		To		Remarks
		Position Title	Position Level	Position Title	Position Level	
1	Sonam Zangmo	Sr. LPO	P4A	Sr. LPO	P3A	January promotion

NDDC Contract Extension of Driver, GSP and ESP renewed during FY-2024-2025

The Contract extension of contract employee of this Centre has been completed and renewed for 3 years and 5 years within this FY-2024-2025 of following (Driver, GSP and ESP) indicated below:

Sl. No	Name	Designation	Position Level	Contract Extension Period	
				From	To
1	Tashi Gyeltshen	Driver	O4A	16/09/2024	15/09/2027
2	Dil Kumar Rai	Wet Cleaner (GSP)	GSP	10/07/2024	30/06/2027
3	Sancha May Blon	Wet Cleaner (GSP)	GSP	01/01/2025	31/12/2029
4	Tashi Lhamo	Wet Cleaner (GSP)	GSP	15/11/2024	14/11/2029
5	Dawa Zangpo	Lab Utility Helper (ESP)	ESP	01/07/2024	30/06/2027
6	Sonam Choden	Lab Utility Helper (ESP)	ESP	01/01/2025	31/12/2029
7	Som Bdr Limboo	Animal Attendant (ESP)	ESP	01/07/2024	30/06/2027
8	Tshering Nedup	Animal Attendant (ESP)	ESP	01/07/2024	30/06/2027
9	San Maya Gurung	Animal Attendant (ESP)	ESP	01/08/2024	31/07/2027
10	Champa Maya Rai	Animal Attendant (ESP)	ESP	01/08/2024	31/07/2027
11	Dhil Bdr Limbu	Pasture Attendant (ESP)	ESP	01/12/2024	30/11/2029
12	Karma Wangzom	Pasture Attendant (ESP)	ESP	01/12/2024	21/12/2027
13	Bhim Raj Subba	Pasture Attendant (ESP)	ESP	01/01/2025	31/12/2029
14	Sonam Gyeltshen	Pasture Attendant (ESP)	ESP	01/08/2024	31/07/2027
15	Roshan Rai	Pasture Attendant (ESP)	ESP	01/01/2025	31/12/2029
16	Babita Rai	Pasture Attendant (ESP)	ESP	01/01/2025	31/12/2029
17	Bee Maya Gurung	Pasture Attendant (ESP)	ESP	01/08/2024	31/07/2027
18	Tashi Chodar	Pasture Attendant (ESP)	ESP	15/11/2024	14/11/2029
19	Rigden	Pasture Attendant (ESP)	ESP	15/11/2024	14/11/2029
20	Kuenga Wangmo	Pasture Attendant (ESP)	ESP	01/07/2024	30/06/2027
21	Kinga Namgyel	Night Guard (ESP)	ESP	01/01/2025	31/12/2029

Staff superannuation and transfer

The following official staff who were superannuated during the FY-2024-2025 are indicted below:

Sl. No	Name	Designation	Position Level	Number of years severed
1	Sangay Tshering	Sr. Livestock Supervisor II	SS2A	38 years, 9months, 19days
2	Kanti Ram Chhetri	Sr. Livestock Supervisor IV	S4C	34 years, 8 months, 5 days
3	Ugyen Wangchuk	Driver	O4A	Voluntary resignation
4	Kuenga Wangmo	Pasture Attendant (ESP)	Internal Transfer	01/06/2025

New staff who joined NDDC Yusipang

Sl. No.	Name	Designation	Remarks
1	Yeshi Wangchuk	Driver	New appointment
2	Khamsang Wangdi	Sr.LS	Transferred from NNPBC, Yusipang
3	Sonam Zangmo	Sr. LPO	Joined after EoL (12/08/2024)
4	Thinley Dorji	Sr. LPO	Joined after EoL (2/06/2025)

Detail of regular staff

Sl. No	Name	Position Title	Position Level
1	Dorji	Specialist III/Offtg Program Director	ES3 A
2	Nar Bahadur Tamang	Specialist I	ES1 A
3	Dhan Bahadur Rai	Specialist II	ES2 A
4	Jigme Wangdi	Specialist II	ES2 A
5	Phuntsho Tobgyel Norbu	Specialist III	ES3 A
6	Deki Choden	Dy. Chief Livestock Production Officer	P2 A
7	Lokey Thapa	Dy. Chief Livestock Production Officer	P2 A
8	Aita Kumar Bhujel	Dy. Chief Livestock Production Officer	P2 A
9	Sonam Zangmo	Sr. Livestock Production Officer	P3 A
10	Sonam Thinley	Dairy Officer	P4 A
11	Thinley Dorji	Sr. Livestock Production Officer	P3 A
12	Karma Tshering Lhaden	Livestock Production Officer	P4A
13	Sonam Phuntsho	Sr. Livestock Supervisor	SS1 A
14	Thukten Dorji	Sr. Livestock Health Supervisor I	SS1 A
15	Abi Narayan Koirala	Sr. Livestock Production Supervisor I	SS2 A
16	Sangay Wangmo	Sr. Livestock Supervisor III	SS3A
17	Indra Bahadur Raika	Sr. Technician II	SS4 A
18	Pema Dorji	Sr. Admin. Asst. V	S2 A
19	Khamsang Wangdi	Sr. LS III	SS 4 A
20	Nima	Sr. Laboratory Asst. V	S2 A
21	Tshewang Lhamo	Jr. Engineer	S2 A
22	Domzang	Driver	O1 A
23	Durga Chhetri	Driver	O1 A
24	Yeshi Wangchuk	Driver	O4 A
25	Tashi Gyeltshen	Driver III	O4 A

Detail of GSP/ESP stationed at NDDC Yusipang and field offices

Sl. No	Name	Position Title	Position	Station
1	Dil Kumar Rai	Wet Cleaner	GSP	NDDC Yusipang
2	Sancha Maya Blon	Wet Cleaner	GSP	NDDC Yusipang
3	Tashi Lhamo	Wet Cleaner	GSP	NDDC Yusipang
4	Som Bdr Limbu	Animal Attendant	ESP	NDDC Yusipang
5	Tshering Nidup	Animal Attendant	ESP	NDDC Yusipang

6	San Maya Gurung	Animal Attendant	ESP	NDDC Yusipang
7	Champa Maya Rai	Animal Attendant	ESP	NDDC Yusipang
8	Dawa Zangpo	Lab Helper	ESP	NDDC Yusipang
9	Kinga Namgyal	Night Guard	ESP	NDDC Yusipang
10	Karma Wangzom	Pasture Attendant	ESP	NDDC Yusipang
11	Dhil Bdr Limbu	Pasture Attendant	ESP	NDDC Yusipang
12	Sonam Gyeltshen	Pasture Attendant	ESP	NDDC Yusipang
13	Roshan Rai	Pasture Attendant	ESP	NDDC Yusipang
14	Bhim Raj Subba	Pasture Attendant	ESP	NDDC Yusipang
15	Babita Rai	Pasture Attendant	ESP	NDDC Yusipang
16	Rigden	Pasture Attendant	ESP	NDDC Yusipang
17	Bee Maya Gurung	Pasture Attendant	ESP	NDDC Yusipang
18	Tashi Chodar	Pasture Attendant	ESP	NDDC Yusipang
19	Sonam Choden	Lab Utility Helper	ESP	Mini Plant, Zhemgang
20	Chador Wangmo	Animal Attendant	ESP	Soelbum Herd Zhemgang
21	Gyem Dorji	Animal Attendant	ESP	Soelbum Herd Zhemgang
22	Nyenjey Choden	Animal Attendant	ESP	Soelbum Herd Zhemgang

Sl No	**Dzongkhag**	**Gewog**	**Name of Group/Coop**	**Type**	**Status**	**Total members**
1	Bumthang	Chhoekhor	Chhoekhor Gonor Gongphel Chithuen Detshen (MPU Tamzhing)	Group	Functional	77
2	Bumthang	-do-	Chhoetoe Chisum Gonor Detshen (Thangbi MPU)	Group	Functional	70
3	Bumthang	-do-	Kinzang Wangchuk MPU (Chhoekhortoe)	Pvt Group	Functional	30
4	Bumthang	-do-	Yeshi MPU (Chhakhar)	Pvt Group	Functional	29
5	Bumthang	-do-	Aum Yoezer Lhamo MPU, Batpalathang	Pvt Group	Functional	20
6	Bumthang	-do-	Samten Cheten, Reribe	Pvt Group	Functional	30
7	Bumthang	Chhumig	Chhumig Gonor Lothuen Detshen (Chhumig MPU)	Group	Functional	21
8	Bumthang	Tang	Ningpo MPU, Pralang	Group	Functional	61
9	Bumthang	-do-	Bepzur Gonor Gongphel Detshen (Bebzur MPU)	Group	Functional	32
10	Bumthang	Ura	Shingkhar Norlha Wangchuk Detshen (Shingkhar MPU)	Group	Non-functional	
11	Bumthang	-do-	Ura Dairy Group (Ura MPU)	Group	Non-functional	

12	Chukha	Chapcha	Chapcha Gonor Chickthen Yargay Detshen	Group	Functional	6
13	Chukha	-do-	Bunorkha Gonor Tshongdrel Detshen	Group	Non-functional	10
14	Chukha	Darla	Darla Gonor Thuenken Gongphel Detshen	Group	Functional	154
15	Chukha	-do-	Chumidlakha Gonor Detshen	Group	Functional	26
16	Chukha	Samphelling	Thongling Ochey Yargye Detshen	Group	Functional	20
17	Chukha	-do-	Nidup Dorji milk collection Group	Group	Functional	18
18	Dagana	Drukjeygang	Manchuna Gonor Detshen	Group	Functional	12
19	Dagana	-do-	Yongsibji Gonor Detshen	Group	Functional	10
20	Dagana	-do-	Thangna Gonor Detshen	Group	Functional	15
21	Dagana	Gozhi	Lower Gozhi Gonor Sochung Detshen	Group	Functional	14
22	Dagana	-do-	Dagapela Gonor Sochung Detshen	Group	Functional	16
23	Dagana	Karna	Dalithang Gonor Thuenkey Detshen	Group	Functional	25
24	Dagana		Thomgang Gonor Thuenken Detshen	Group	Functional	20
25	Dagana		Lajab GonorThonkey Detshen	Group	Functional	32
26	Dagana		Dzongsel Gonor Thuenkey Detshen	Group	Functional	6
27	Dagana		Zinchilla Maa Datsi Thonkey Detshen	Group	Functional	30
28	Dagana	Gesarling	Trashithang gonor gogphel Detshen	Group	Functional	30
29	Dagana	Lhamoi Dzingkha	Lhamoizingkha Om Detshen	Group	Functional	17
30	Dagana	-do-	Tshamzhigosa Gonor Thenkey Detshen	Group	Functional	26
31	Dagana	Tashiding	Tashiding Gonor Gongphel Detshen	Group	Functional	37
32	Dagana	-do-	Dagapela Gonor thuenkey Detshen	Group	Functional	40
33	Gasa	Khamaed	Khamaed Gonor Detshen	Group	Functional	47
34	Haa	Bji	Yangthang Om Gongphel Detshen	Group	Functional	32
35	Haa	-do-	Talung Om Tshongdrel Detshen	Group	Functional	28

36	Haa	-do-	Hatey Om Tshongdrel Detshen	Group	Functional	29
37	Haa	-do-	Tokey-Gyensa Om Tshongdrel Detshen	Group	Functional	20
38	Haa	Kar-tshog	Ketshen Amtsu Namrub Tshongdrel Detshen	Group	Functional	37
39	Haa	-do-	Chundu Yarab Detshen	Group	Functional	18
40	Haa	-do-	Draktshen Norlha Detshen	Group	Functional	28
41	Haa	-do-	Drading Norlha Detshen	Group	Functional	37
42	Haa	Uesu	Uesu Meriphensum cooperative	Cooperative	Functional	45
43	Haa	Gakiling	Dorithasa dairy group	Group	Functional	27
44	Haa	Samar	Lhakhang Chen Norlha Detshen	Group	Functional	28
45	Haa	-do-	Balamna Gonor Tshongdrel Detshen	Group	Functional	28
46	Haa	-do-	Shari Chithuen Detshen	Group	Functional	14
47	Haa	-do-	Jyenka-Pudu Zombalha Detshen	Group	Functional	22
48	Haa	-do-	Doriub Noryang Layjay Detshen	Group	Functional	15
49	Haa	Sangbay	Sangbayama Gonor Gongphel Detshen	Group	Functional	25
50	Haa	-do-	Batsho Gonor Gongphel	Group	Functional	10
51	Haa	-do-	Jo Langeri Gonor Gongphel Detshen	Group	Functional	27
52	Lhuentse	Minjey	lhamo norguen phendey detshen	Group	Functional	24
53	Lhuentse	-do-	Zamblha Dairy Group	Group	Functional	15
54	Lhuentse	Maenbi	Maenbi Gonor Thenkey Detshen	Group	Functional	21
55	Mongar	Balam	Balam Gonor Detshen	Group	Functional	23
56	Mongar	-do-	Bakaphai Gonor Detshen	Group	Functional	16
57	Mongar	-do-	Jadung Gonor Detshen	Group	Functional	34
58	Mongar	-do-	Khebishing Gonor Detshen	Group	Functional	10
59	Mongar	-do-	Selkhar Gonor Detshen	Group	Functional	11

60	Mongar	Chagsakhar	Chaskhar Gonor Gongphel Nyamley Tshogdhey	Cooperative	Functional	20
61	Mongar	-do-	Dungkar Choeling Gonpa Gonor Gongphel Detshen	Group	Functional	35
62	Mongar	-do-	Yetong Gonor Gongphel Detshen	Group	Functional	34
63	Mongar	-do-	Kharnang Lam-tag Lam-wog Gonor Gongphel Detshen	Group	Functional	40
64	Mongar	Dramedtse	Kheshung-Dramedtse Gonor Detshen	Group	Non-functional	17
65	Mongar	-do-	Bikhar-Waichure Gonor Detshen	Group	Non-functional	14
66	Mongar	-do-	Zangkhar Gonor Detshen	Group	Non-functional	15
67	Mongar	Shermuhoong	Sershong Aumtsu Gonor Gongphel Detshen	Group	Functional	20
68	Mongar	Thang-Rong	Thangrong Gonor Namdrel Detsen	Group	Functional	29
69	Mongar	Saling	Tshenzibe Gonar Dang Soenam Cherup Detshen	Group	Functional	11
70	Mongar	-do-	Thidangbe Gonor Khuenphen Detshen	Group	Functional	25
71	Mongar	-do-	Sengor Norlha Chethuen Tshogpa	Group	Non-functional	
72	Mongar	Chhaling	Pangthang Gonor Nymdrel Deten	Group	Functional	18
73	Mongar	Monggar	Takchu Gonor and Sonam Ngamrub Detshen	Group	Functional	12
74	Mongar	-do-	Wengkhar Om Thuendrel Detshen	Group	Functional	19
75	Mongar	-do-	Pangtoed Gonor Ngamrub Detshen	Group	Functional	4
76	Mongar	-do-	Wangling Norlha Detshen	Group	Functional	17
77	Mongar	-do-	Phosorong Om Namdrel Detshen	Group	Functional	10
78	Mongar	-do-	Jampachokorling Om Chithuen Detshen	Group	Functional	20
79	Mongar	-do-	Yakpugang Om Namdrel Detshen	Group	Functional	34
80	Mongar	-do-	Kilikhar Gonor/Sonam Ngyamrub Detshen	Group	Functional	15
81	Mongar	-do-	Tongseng Om Thuendrel Detshen	Group	Functional	13

82	Mongar	-do-	Jaibab Zambala Detshen	Group	Functional	23
83	Mongar	-do-	Thamnangbi Om Gotsung Ngamlay Detshen	Cooperative	Functional	18
84	Mongar	-do-	Dedrang Om Thuendrel Detshen	Group	Functional	7
85	Mongar	-do-	Zhongkhar Nazhoen Gongphel Detshen	Group	Functional	5
86	Paro	Dokar	Dokar Om Chikthoen Tshogpa	Group	Functional	56
87	Paro	Loong-nyi	Lungnyi kuenchab Omgi Detshen	Group	Functional	32
88	Paro	-do-	Nemjo Lamten Omgi Tshogpa	Group	Functional	15
89	Paro	Sharpa	Shaba Phunsum Omgi	Group	Functional	14
90	Paro	Dopshar-ri	Shari Luethen Omgi Tshogpa	Group	Functional	43
91	Paro	-do-	Damchena Omgi tshogpa	Group	Functional	26
92	Paro	Doteng	Doteng Amsu Chithen Om Detshen	Group	Functional	49
93	Paro	Lamgong	Lamgong norlha namley tshogpa	Group	Functional	19
94	Paro	Tsento	Tsento Amso Tshogpa	Group	Functional	42
95	Paro	-do-	Drugyel Cherub Tshongpa	Group	Functional	27
96	Pemagatshel	Dechenling	Redzemo Jersey Gongphel Detshen	Group	Functional	13
97	Pemagatshel	Nanong	Nanong-Raling Gonor Wongbab Detshen	Group	Functional	97
98	Pemagatshel	-do-	Terda Puensum Gonor Detshen	Group	Functional	57
99	Pemagatshel	-do-	Tokari Gonor Gongphel Detshen	Group	Functional	24
100	Pemagatshel	-do-	Tsatsi-Dajor Norlha Detshen	Group	Functional	104
101	Pemagatshel	Norboogang	Nanglam Gonor Gongphel Detshen	Group	Functional	18
102	Pemagatshel	-do-	Zambala Natshog Namlay Tshogday	Group	Functional	65
103	Pemagatshel	Shumar	Bartseri Gonor Chithuen Detshen	Group	Functional	5
104	Pemagatshel	-do-	Shumar Chuden Tshephel Detshen	Group	Functional	61
105	Pemagatshel	Yurung	Khangma Gonor Gongphel Detshen	Group	Functional	38

106	Pemagatshel	-do-	Yurung Sonam Dang Gonor Gongphel Detshen	Group	Functional	22
107	Pemagatshel	Zobel	Resinang Dairy Group	Group	Functional	28
108	Pemagatshel	-do-	Tshelingkhor Gonor Chuethen Detshen	Group	Functional	28
109	Punakha	Guma	Pungdzong DFGs	Group	Functional	90
110	Punakha	Kabisa	Eusakha Chortenipo gonor Namrub detshen	Group	Functional	22
111	Samdrupjongkhar	Deothang	Deothang Milk marketing corporative (DMMC)	Cooperative	Functional	25
112	Samdrupjongkhar	-do-	Martang Dairy Group	Group	Functional	25
113	Samdrupjongkhar	-do-	Rekhay-Domphu Milk Group	Group	Functional	63
114	Samdrupjongkhar	Langchenphu	Langchenphu Om Tshongdrel Detshen	Group	Functional	25
115	Samdrupjongkhar	Orong	Orong Dairy Group	Group	Functional	115
116	Samdrupjongkhar	-do-	Wooling Dairy Group	Group	Functional	56
117	Samdrupjongkhar	-do-	Jangchubling Dairy Group	Group	Functional	64
118	Samdrupjongkhar	Phuntshothang	Minjigang om tshongdrel detsen	Group	Functional	44
119	Samdrupjongkhar	-do-	Phuntshothang om tsongdrel detsen	Group	Functional	47
120	Samdrupjongkhar	Gomdar	Gomdar Om Nyam lay tshodhey	Group	Functional	148
121	Samdrupjongkhar	Lauri	Tshothang Jersey Desthen	Group	Functional	13
122	Samdrupjongkhar	-do-	Tshothang	Group	Functional	15
123	Samdrupjongkhar	-do-	Zangthi Dairy Group	Group	Functional	25
124	Samdrupjongkhar	-do-	Dungmana Dairy Group	Group	Functional	25
125	Samdrupjongkhar	-do-	Lauri Dairy Group	Group	Functional	40
126	Samdrupjongkhar	-do-	Momring Dairy Group	Group	Functional	20
127	Samdrupjongkhar	Martshala	Galingkhar-Wangphu Dairy Group	Group	Functional	8
128	Samdrupjongkhar	-do-	Keptang- Tsholingkhar Dairy Group	Group	Functional	20
129	Samdrupjongkhar	-do-	Tshotsal-rawshing Dairy Group	Group	Functional	8

130	Samdrupjongkhar	-do-	Sarjung-Shem shem Dairy Group	Group	Functional	27
131	Samdrupjongkhar	-do-	Kakani-Chomashing Dairy Group	Group	Functional	15
132	Samdrupjongkhar	-do-	Martshala-Kakpadung Dairy Group	Group	Functional	12
133	Samdrupjongkhar	-do-	Dungmanma Jersey Sochong Detshen	Group	Functional	22
134	Samdrupjongkhar	-do-	Wangphu Yuesum Thuendrel Detshen	Group	Functional	24
135	Samdrupjongkhar	Pemathang	Pemathang Om Tshongdrel Detshen	Group	Functional	12
136	Samdrupjongkhar	Serthig	Phagchu-Suskar Dairy Group	Group	Functional	15
137	Samdrupjongkhar	-do-	Denphu-Deptshang Dairy Group	Group	Functional	23
138	Samdrupjongkhar	-do-	Monmola-Tashithangjay Dairy Group	Group	Functional	24
139	Samdrupjongkhar	-do-	Dangtsho-Serthi Dairy Group	Group	Functional	18
140	Samdrupjongkhar	-do-	Minjiwoong-Khanduphung Dairy Group	Group	Functional	15
141	Samtse	Duenchhukha	Remitey Dairy Group Dairy Group	Group	Functional	10
142	Samtse	-do-	Denchukha Aumtshu Gonor Gongphel Detshen	Group	Functional	23
143	Samtse	Dophuchen	Lhop Dairy Group	Group	Functional	30
144	Samtse	Tading	Phuensum Dairy Group	Group	Functional	35
145	Samtse	Norboogang	Kydsa-Khangduzhi Gonor Detshen	Group	Functional	43
146	Samtse	Tashichhoeling	Choling Yargey Detshen	Group	Functional	25
147	Samtse	Tendruk	Tendruk Dairy Sale counter	Group	Functional	17
148	Samtse	Ugyentse	Gonor Gongphel Detshen	Group	Functional	22
149	Samtse	Yoeseltse	Yoseltse Jersey Detshen	Group	Functional	3
150	Sarpang	Gelegphu	Gelephu Om Detshen	Group	Functional	153
151	Sarpang	Jigme Chhoeling	Jigmecholing Dairy Group	Group	Functional	22
152	Sarpang	Umling	Umling Maar Datshi Detshen	Group	Functional	16
153	Sarpang	Dekiling	Louthen Om Detshen (Dekiling)	Group	Functional	30

154	Sarpang	Shompangkha	Louthen Om Detshen (Shompangkha)	Group	Functional	40
155	Thimphu	Kawang	Chamina Om Detshen	Group	Functional	8
156	Thimphu	-do-	Dashi Om Detshen	Group	Functional	3
157	Thimphu	-do-	Hangowog Om Detshen	Group	Functional	5
158	Thimphu	-do-	Begana Om Detshen	Group	Functional	6
159	Thimphu	Chang	Rama Om Detshen	Group	Functional	5
160	Thimphu	-do-	Hongtsho Om Detshen	Group	Functional	20
161	Thimphu	-do-	Yusipang Om Detshen	Group	Functional	7
162	Thimphu	Maedwang	Namseling Dairy group	Group	Functional	3
163	Thimphu	-do-	Wangsisina Om Detshen	Group	Functional	16
164	Thimphu	-do-	Tshaluna Om Detshen	Group	Functional	32
165	Trashigang	Yangnyer	Druk Chikthen Namlay Tsogdey	Group	Functional	110
166	Trashigang	Shongphu	Basu Dara Namley Tshogdhey(Chaling)	Group	Functional	32
167	Trashigang	-do-	Phunsum Dairy Group(Shongphu)	Group	Functional	25
168	Trashigang	-do-	Kuenphel Ngamdrel Tshokpa(Gongsephangma)	Group	Functional	4
169	Trashigang	-do-	Thinley Samphel Tshokpa(Changmey)	Group	Functional	14
170	Trashigang	-do-	Yobinang Dairy Group	Group	Functional	11
171	Trashigang	-do-	Buna Dairy Group	Group	Functional	6
172	Trashigang	Kanglung	Dungkarcholing Jersey Group	Group	Functional	30
173	Trashigang	Samkhar	Bikhar-Domkhar Gonor Gongphel Detshen	Group	Functional	14
174	Trashigang	-do-	Khapti-Bikhar Gonor Gongphel Detshen	Group	Functional	18
175	Trashigang	-do-	Pam Medey Namley Tshogdey	Group	Functional	48
176	Trashigang	-do-	Yusum Gonor Gongphel Detshen	Group	Functional	24
177	Trashigang	-do-	Tashi Tsheringma Namley Tshodey	Group	Functional	43

178	Trashigang	-do-	Samkhar Norla Gonor Detshen(Samkhar)	Group	Functional	11
179	Trashigang	-do-	Bazor Detshen	Group	Functional	2
180	Trashigang	Phongmed	Gazari Dairy Group	Group	Functional	1
181	Trashigang	-do-	Lhabum Tashi Yangphel Gonor Detshen	Group	Functional	8
182	Trashigang	Thrimshing	Tsangpo Dairy Group	Group	Functional	5
183	Trashiyangtse	Khamdang	Gonor Chithun Tshogpa	Group	Functional	27
184	Trashiyangtse	Jamkhar	Jamkhar Milk group	Group	Functional	40
185	Trashiyangtse	Ramjar	Wangringmo Mardatse Detshen	Group	Functional	10
186	Trongsa	Draagteng	Draagteng Dairy Development Tshogpa	Group	Functional	35
187	Trongsa	Nubi	Nubi Om Namlay Dhetsen	Group	Functional	20
188	Trongsa	-do-	Simphu Om Phendhey Tshogpa	Group	Functional	51
189	Trongsa	Tangsibji	Tangsibji Om Thuenkhung Tshogpa	Group	Functional	22
190	Tsirang	Patshaling	Patshaling Gonor Gongphel Detshen	Group	Functional	90
191	Tsirang	Mendrelgang	Mendrelgang Om Detshen	Group	Non-functional	38
192	Tsirang	Rangthangling	Dongacholing Om Detshen	Group	Functional	75
193	Tsirang	Kilkhorthang	Kilkhorthang Gonor Thuenkey Detshen	Group	Functional	58
194	Tsirang	Tsholingkhar	Tsholingkhar Om Thuenkey Datshen	Group	Functional	75
195	Tsirang	Gosarling	Gosarling Om Thuenkey Detshen	Group	Functional	66
196	Tsirang	Semjong	Semjong Om Thuenkey Detshen	Group	Functional	64
197	Wangduephodrang	Bjenag	Khotokha Gonor Yargay Detshen	Group	Functional	45
198	Wangduephodrang	Gase Tshogongm	GaseTsho-Gom Om Detshen	Group	Functional	47
199	Wangduephodrang	Thedtsho	Thedtsho Omi Detshen	Group	Functional	28
200	Wangduephodrang	Gangteng	Mang Gonor Yargay Detshen	Group	Functional	43

201	Wangduephodrang	-do-	Gogona Gonor NamdrelYergay Destshen	Group	Functional	22
202	Wangduephodrang	Phobji	Khemro Kuenphen Omgi Detshen	Group	Functional	69
203	Wangduephodrang	Saephu	Rukubji Gonor Nyemdrel Detshen	Group	Non-functional	36
204	Zhemgang	Shingkhar	Thrisa Nazhoen Gonor Gongphel Detshen	Group	Functional	36
205	Zhemgang	Trong	Tshanglajong MPU	Group	Functional	7
206	Zhemgang	-do-	Trong Dangkhar Gonor Chethun MPU	Group	Functional	20
207	Zhemgang	Goshing	Nor Yangtsho MPU, Lingmapong	Group	Functional	22
208	Zhemgang	-do-	Norbu Samphel MPU, Lamtang	Group	Non-functional	19
209	Zhemgang	Ngangla	Panbang Magdrep Gonor Om Tshongdrel Cooperative	Group	Functional	21

4. REVISED BUDGET/EXPENDITURE

FISCAL YEAR 2024-2025

ADMINISTRATIVE UNIT: 218.01 MINISTRY OF AGRICULTURE & LIVESTOCK

DEPARTMENT: 04 DEPARTMENT OF LIVESTOCK

FIELD OFFICE: 34 NATIONAL DAIRY DEVELOPMENT CENTRE

(Nu. in Millions)

PRG	SPRG	ACT	SACT	FIC	OBC	TITLE	BUDGET	EXPENDITURE	BALANCE	%
209						ECONOMIC TRANSFORMATION				
	408					ENHANCE SUPPORT TO SUBSISTENCE FARMING FOR IMPROVED LIVELIHOOD AND FOOD SECURITY				
		001				INTENSIFY DAIRY BREED IMPROVEMENT PROGRAM FOR ENHANCE MILK PRODECTION TO ACHIVE 85 PERCENT OF THE TOTAL MILK CONSUMPTION THROUGH DOMESTIC PRODUCTION				
			01			PROCUREMENT OF PROGENY TESTED GENOMIC SELECTED CONVENTIONAL AND SEX SORTED BOVINE FROZEN SEMEN				
				5978		Promoting inclusive, sustainable and resilient Agri-Food				
						systems in Bhutan (NDICI ASIA/2021/043-160)				
					52.06	Plant & Equipt. - Livestock	8.450	8.444	0.006	0.07
						TOTAL OF FIC 5978	**8.450**	**8.444**	**0.006**	
						TOTAL OF SAct 01	**8.450**	**8.444**	**0.006**	
			02			PROCUREMENT OF LN2 PLANT ESSENTIAL PARTS FOR TWO PLANTS AT NDDC YUSIPANG AND ONE PLANT AT ZHEMGANG PAYMENT OF ANNUAL MAINTENANCE CONTRACT TO CONTRACT FIRMS AND MEET ENERGY PROPULSION CHARGES TO RUN THREE PHASE LN2 PLANT AT THE CENTRE AND AT ZHEMGANG				
				5978		Promoting inclusive, sustainable and resilient Agri-Food				
						systems in Bhutan (NDICI ASIA/2021/043-160)				
					52.07	Plant & Equipt. - Hospital/Lab. Equipment	3.743	3.724	0.019	0.50
						TOTAL OF FIC 5978	**3.743**	**3.724**	**0.019**	
						TOTAL OF SAct 02	**3.743**	**3.724**	**0.019**	
			03			PROCUREMENT OF LN2 CONTAINERS SEMEN PROCESSING AI AND FARM EQUIPMENT				
				0001		RGOB Financing				
					52.07	Plant & Equipt. - Hospital/Lab. Equipment	1.000	0.993	0.007	0.65
						TOTAL OF FIC 0001	**1.000**	**0.993**	**0.007**	
						TOTAL OF SAct 03	**1.000**	**0.993**	**0.007**	
			04			MANAGEMENT OF ROYAL SOELBUM HERD ZHEMGANG				
				0001		RGOB Financing				
					52.08	Plant & Equipt. - General Tools, Instruments	0.850	0.850		
						TOTAL OF FIC 0001	**0.850**	**0.850**		
						TOTAL OF SAct 04	**0.850**	**0.850**		
						TOTAL OF Act 001	**14.043**	**14.012**	**0.031**	
		002				STRENGTHEN DAIRY VALUE CHAIN FOR NEW AND IMPROVED PRODUCTS				
			01			PROCUREMENT OF LABORATORY EQUIPMENT CONSUMABLES AND MILK QUALITY TESTING EQUIPMENT AND SAMPLE COLLECTION FOR QUALITY ASSESSMENT USERS TRAINING OF EQUIPMENT TRAINING OF FERMARS AND EXTENSION AGENTS ON IMPROVING DAIRY VALUE CHAIN FOR ENHANCED FOOD AND NUTRITION SECURITY				
				5978		Promoting inclusive, sustainable and resilient Agri-Food				
						systems in Bhutan (NDICI ASIA/2021/043-160)				
					52.07	Plant & Equipt. - Hospital/Lab. Equipment	1.500	1.500		
						TOTAL OF FIC 5978	**1.500**	**1.500**		
						TOTAL OF SAct 01	**1.500**	**1.500**		
						TOTAL OF Act 002	**1.500**	**1.500**		
						TOTAL OF SPrg 408	**15.543**	**15.512**	**0.031**	
						TOTAL OF Prg 209	**15.543**	**15.512**	**0.031**	
213						TRANSFORMATIONAL GOVERNANCE				
	203					ENSURE EFFECTIVE AND EFFICIENT SERVICE DELIVERY				

ADMINISTRATIVE UNIT: 218.01 MINISTRY OF AGRICULTURE & LIVESTOCK

DEPARTMENT: 04 DEPARTMENT OF LIVESTOCK

FIELD OFFICE: 34 NATIONAL DAIRY DEVELOPMENT CENTRE

(Nu. in Millions)

PRG	SPRG	ACT	SACT	FIC	OBC	TITLE	BUDGET	EXPENDITURE	BALANCE	%
		001				GENERAL ADMINISTRTATION AND DIRECTION SERVICES				
			01			PERSONNEL EMOULMENTS				
				0001		RGOB Financing				
					01.01	Pay and Allowances	17.911	17.909	0.002	0.01
					02.01	Other Personnel Emoluments	5.519	5.518	0.001	0.02
					24.03	Contributions - Provident Fund	1.719	1.718	0.001	0.06
					25.01	Retirement Benefits	1.946	1.944	0.002	0.13
						TOTAL OF FIC 0001	**27.095**	**27.089**	**0.006**	
						TOTAL OF SAct 01	**27.095**	**27.089**	**0.006**	
			02			OPERATION AND MANAGEMENT SERVICES				
				0001		RGOB Financing				
					12.01	Utilities -Telephones and Internet	0.075	0.074	0.001	0.94
					12.03	Utilities - Electricity, Water, Sewerage,Waste	0.304	0.303	0.001	0.22
					12.05	Utilities - Fuelwood	0.005	0.005	0.000	4.97
					14.01	S & M - Office Supplies, Printing, Publications	0.184	0.184	0.000	0.24
					14.02	S & M - Medicines & Laboratory Consumables	0.080	0.080	0.000	0.15
					14.06	S & M - Uniforms, Extension Kits, Linens	0.050	0.050		
					15.02	Maintenance of Property - Vehicles	1.021	1.020	0.001	0.09
					15.09	Maintenance of Property - Water supply, Sewerage, Playfield	0.020	0.019	0.001	6.00
					17.02	Op. Exp. - Taxes, Duties, Royalties, Fees, Handling Charges, Bank Charges	0.842	0.842	0.000	0.02
					17.08	Op. Exp. - Incountry Meetings and Celebrations	0.100	0.100	0.000	0.05
					54.03	Computers & Peripherals				
						TOTAL OF FIC 0001	**2.681**	**2.676**	**0.005**	
						TOTAL OF SAct 02	**2.681**	**2.676**	**0.005**	
			03			ADMINISTRATIVE SERVICES AND STAFF MOBILITY				
				0001		RGOB Financing				
					11.01	Travel - Incountry	0.706	0.706	0.000	0.00
						TOTAL OF FIC 0001	**0.706**	**0.706**	**0.000**	
						TOTAL OF SAct 03	**0.706**	**0.706**	**0.000**	
			04			ANIMAL FEEDS				
				0001		RGOB Financing				
					14.05	S & M - Animal Feeds	3.000	3.000	0.000	0.01
						TOTAL OF FIC 0001	**3.000**	**3.000**	**0.000**	
						TOTAL OF SAct 04	**3.000**	**3.000**	**0.000**	
						TOTAL OF Act 001	**33.482**	**33.471**	**0.011**	
						TOTAL OF SPrg 203	**33.482**	**33.471**	**0.011**	
						TOTAL OF Prg 213	**33.482**	**33.471**	**0.011**	
						TOTAL OF FO 34	**49.025**	**48.983**	**0.042**	
						TOTAL OF Dept 04	**49.025**	**48.983**	**0.042**	
						TOTAL OF AU 218.01	**49.025**	**48.983**	**0.042**	
						GRAND TOTAL	**49.025**	**48.983**	**0.042**	