



The Milky Way Program

Transforming Nepal's Dairy Sector





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This paper was researched and written by Charlie Pye-Smith, an independent author with expertise in agriculture and global development issues. The paper was funded by Heifer International, but the views expressed therein are those of the author.

*The author and Heifer International would like to thank the many partners and participant farmers of the *Milky Way* Program in Nepal who kindly volunteered their time and resources to provide input for this paper.*

ON THE COVER

Villagers in Kamalamai, Sindhuli, celebrate the arrival of Korean Holstein Heifers, symbolizing innovation and growth in Nepal's dairy sector. Photo by Heifer International.

The *Milky Way* Program

Executive Summary

The *Milky Way* Program seeks to transform Nepal's dairy sector by significantly improving its productivity, efficiency and business ecosystem. A joint initiative of the Government of Nepal, the Government of South Korea and Heifer International, the program is developing and scaling up a new model of smallholder-focused dairy husbandry based on improved genetics and animal management; modernizing the dairy value chain; and catalyzing policy, regulatory and business environments that encourage greater investment by farmers and other parties. The program's primary objectives are to help 500,000 smallholder farming families significantly increase their incomes while reducing Nepal's heavy dependence on imported dairy products.

Approximately 65 percent of Nepali households depend on agriculture for their livelihoods and food security, with one half of these households keeping at least one dairy animal. However, the great majority of these cows are not raised for commercial purposes and provide relatively meager quantities of milk – less than a tenth of yields in countries like the U.S. or South Korea. The primary reasons for low yields are poor animal genetics, nutrition and health practices.

Confronted by high production costs, low confidence in the market, poor breeding support and weak farm advisory services, most smallholder farmers are unable or unwilling to invest in practices to improve productivity. The *Milky Way* Program seeks to address these issues with a systems-level, holistic approach, in partnership with public and private stakeholders at the global, national, regional and local levels.

The most important tool for breed improvement is artificial insemination (AI), and it was a lack of high-quality semen that originally prompted the Government of Nepal to approach Heifer International in 2019 with a request for collaboration.

The resulting *Milky Way* Program was launched in December 2022, with Heifer International facilitating shipments from South Korea of 100 high-genetic-worth Holstein heifers, five Holstein bull calves, one Jersey bull calf and two Holstein bulls with high-grade genetic merit.

Since then, Heifer International, governmental and local partners have established a Model Dairy Village with a nucleus herd of pedigreed Holstein cows, managed and owned by smallholder farming families, in the Kamalamai Municipality of Sindhuli District. South Korean bulls managed at Nepal's National Livestock Breeding Offices are also beginning to supply high-quality semen for use of AI across the country.

This paper describes the context, rationale and overall strategy of the *Milky Way* Program and documents its progress as of mid-2024. This was early in the program's 10-year horizon and much remains to be done to achieve the program's ambitious objectives, but the early results appear encouraging. The author visited program sites in May 2024 and conducted interviews with several parties involved. It was clear that a wide range of stakeholders – from smallholder farmers and local municipalities to government agencies, international funders and the private sector – are actively collaborating to transform dairy practices and markets in ways that will increase productivity and incomes while making dairy husbandry practices more environmentally sustainable.

The stakeholders' common goal is that the *Milky Way* Program will help catalyze a stronger, more profitable and more self-sustaining dairy sector that benefits not only smallholder farmers but also multiple actors along the dairy value chain, as well as Nepali consumers in the form of higher-quality and readily available domestically produced dairy products. The Nepal Government also aspires to set an example for other low- and middle-income countries facing similar challenges in dairy development.



Milky Way Program Director Keshav Sah stands alongside Madhav Adhikari, left, and Rukmani Adhikari, right, who received two heifers from South Korea. Photo by Heifer International.

Introduction

Heifer International's Livestock Legacy

Heifer International is a global nonprofit organization that works with smallholder farming households in low- and middle-income countries (LMICs) to sustainably address poverty and hunger in their communities while caring for the Earth. Heifer International began in 1944 as what was then called Heifers for Relief, an organization founded by Indiana farmer Dan West. His experience as a relief worker during the Spanish Civil War led him to believe that what rural people needed most to build their resilience was the means to generate lasting improvement in their livelihoods rather than just food aid.

A key feature of Heifer's locally led approach is to help farmers organize themselves into self-help groups and cooperatives that develop agrienterprises to engage successfully in formal agricultural markets – including those for animal-source products such as milk and meat – to increase farmers' income potential. Heifer also emphasizes support for women smallholder farmers and many of the cooperatives and enterprises are women-led. Heifer also builds relationships with governments, businesses, global development funders and civil society groups to build more inclusive agricultural value chains and enabling environments that benefit smallholders.

Heifer currently operates in 19 countries across Asia, Africa and the Americas, and it has been notably active in Nepal since the 1990s. In Heifer's early years, long-haul livestock shipments were accompanied by "seagoing cowboys" who provided technical advice and helped local communities build up their livestock industries.

The most recent international transfer of livestock involved pedigree Holsteins cows from South Korea to Nepal under the *Milky Way* Program in late 2022 and early 2023.

In fact, this shipment to Nepal was an exception to how Heifer has been operating for many decades; it no longer facilitates international livestock transfers but focuses on local provision of animals. Heifer also has broadened its activities to support farmers in many other agricultural value chains beyond livestock.

Passing on the Gift® (PoG) is an important element of Heifer International's model. Individuals and organizations who have been helped by Heifer through its programs agree to donate one or more of the offspring of the animals they have received to other families in the community and to share their skills and knowledge of animal husbandry to expand the impact of the original "gift." The same principle applies to Heifer's work in other value chains – for example, with crops such as corn or tomatoes, participant farmers might pass along seeds, harvested produce or planting gear to others.

South Korea's shipment of heifers and bulls to Nepal, described below, is an example of PoG at the international level. South Korea benefited for decades from Heifer International's assistance to build up its own dairy sector and it is now "giving back" by helping Nepal do the same.

The Road to the *Milky Way* Program

The path to South Korea's gift of Holstein cows to Nepal began with a workshop in Pokhara, Western Nepal, in 2019. Mahendra Lohani, then senior vice president of Asia Programs at Heifer International, was approached there by the director-general of Nepal's Department of Livestock Services and the joint secretary of the Ministry of Agriculture and Livestock Development with a specific request: could Heifer International help the government arrange the importation of high-quality dairy bulls to supply the country's artificial insemination (AI) services? The decision to reach out to Heifer International reflected the government's longstanding partnership with the global nonprofit in the smallholder livestock sector and built trust as a result.

Most of the bulls in Nepal's breeding centers were of lesser or declining quality and many were approaching the end of their productive lives. The Pokhara workshop conversation set in motion discussions leading to the establishment of the *Milky Way* Program, which launched officially in December 2022 with the first of four shipments of cattle from South Korea to Nepal.

The program is a joint initiative between the Governments of Nepal and South Korea, facilitated by Heifer International, Heifer Nepal and Heifer Korea. The program seeks to transform Nepal's dairy sector by developing and scaling up a new model based on improved genetics and smallholder-based animal management practices; modernizing the national dairy value chain; and strengthening the dairy sector ecosystem through policy, regulatory and market development activities.

The potential for smallholder dairy farmers to improve their livelihoods through production of milk and other dairy products is limited primarily by low livestock productivity and poor management practices.

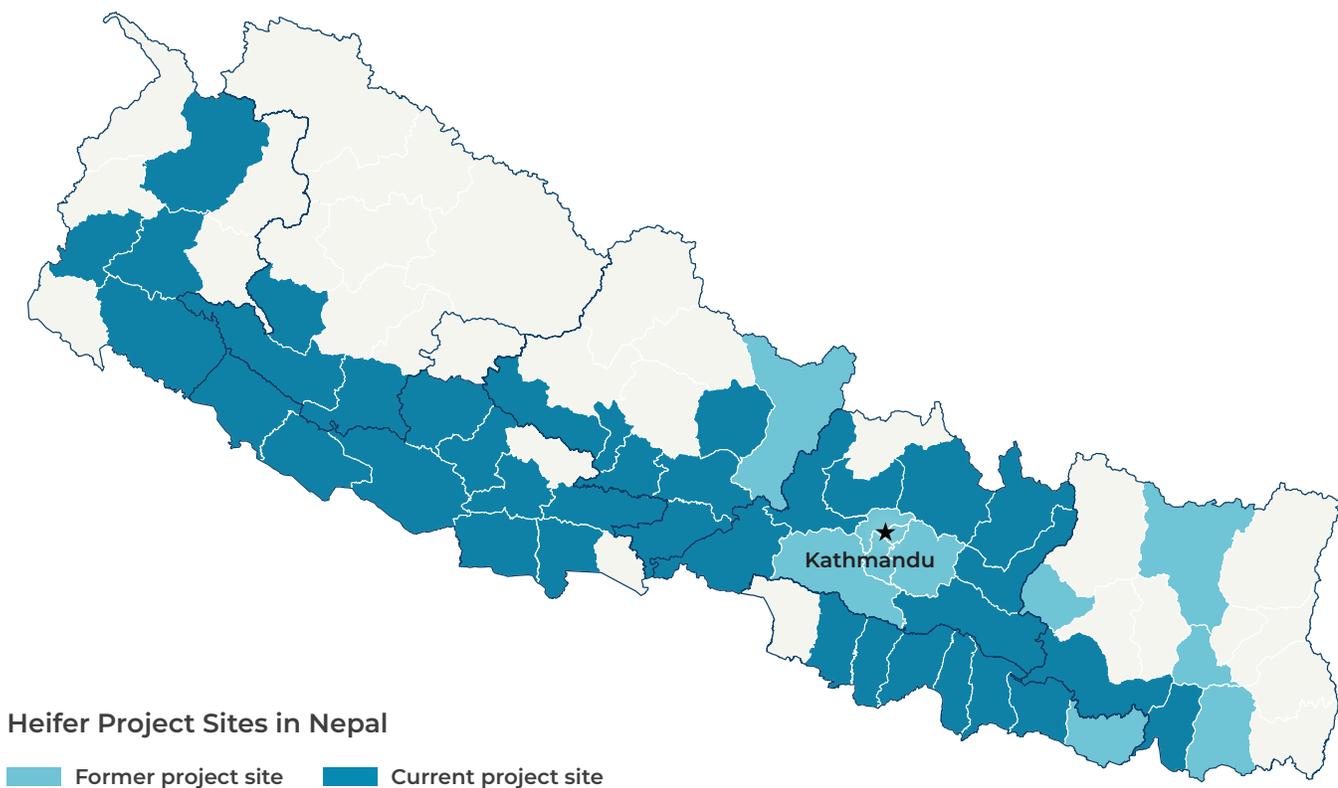
Currently, the average Nepali crossbred cow produces around 9L of milk a day, a relatively paltry level on the global scale; indigenous Nepali breeds tend to produce substantially less¹. By making available high-quality semen from purebred Holstein bulls, the *Milky Way* Program is poised to help farmers to significantly raise their yields and incomes.

While the initial request to Heifer International from the Government of Nepal was for breeding bulls, Heifer Nepal made the case for a more sustainable domestic breeding system based on both pedigree heifers and bulls. "Otherwise, it would mean [Nepal] would have to import more pedigree bulls when [the current stock of bulls] ones were no longer productive," explained Bhola Shrestha, Heifer Nepal's technical director of the *Milky Way* Program. "It was important for Nepal to establish its own nucleus herd to produce high genetic worth bulls required by NLBOs for semen production and AI." In addition, this model held the promise of significantly more genetic material being made available for AI and would also greatly accelerate the pace at which genetic gains could be achieved across Nepal.

Thus, in addition to the imported Holstein bulls, Holstein heifers donated by South Korea are being inseminated to produce pure-bred calves in a Model Dairy Village (MDV) in Kamalamai Municipality, Sindhuli District. First-born female calves are passed on as gifts to other smallholder farmers in the area while selected bull calves are transferred to government breeding centers to increase the future stock of bulls able to produce high-quality semen. Farmers may retain subsequent female calves to expand their herds or sell them to other farmers.

The goal is to expand the positive effects of the MDV in other parts of the country through the dissemination of best practices developed in the MDV as well as the distribution of high-quality semen from the NLBOs. The program aims to help 500,000 small-scale dairy farming families improve their productivity and incomes while reducing Nepal's heavy dependence on imports of dairy products — particularly higher-quality dairy products.

¹ Annual Report 2072/73 (2015/16) - Animal Breeding Division, National Agricultural Research Council. <http://elibrary.narc.gov.np/?r=3249>



Leveraging Heifer's Presence in Nepal

Heifer International has a long history in Nepal. In 1957, two shipments of high-yielding breeds of pig, cattle and sheep were donated to the Government.² Before then, smallholder farmers had relied almost exclusively on indigenous breeds and most farmers in fact still do. It is estimated that somewhere between 13-25 percent of the country's cattle are improved crossbreeds and 5 percent are higher-productivity purebreds, mostly Holsteins or Jerseys, with the latter being relatively smaller and well-suited to mountainous parts of Nepal.³ The pathway to increasing milk yields is largely through use of purebred semen crossed with indigenous and locally crossbred cattle. This is why improving the quality and quantity of semen is so important and a key feature of the *Milky Way* Program.

Heifer Nepal was established as a legal entity in 1997, and much of its work is focused on promoting smallholder entrepreneurship in agricultural value chains. Heifer Nepal's approach is based on what Heifer International refers to as values-based holistic community development to build social capital within farming communities that can help spur successful collective enterprises. Working with a range of partners, Heifer also provides technical assistance and facilitates access to technologies, finance, key infrastructure and formal markets.

Heifer International Nepal is currently active in 40 out of 77 districts and has reached nearly 400,000 farming households. By mid-2024, it had helped to establish 18,000 self-help groups primarily composed of women farmers and 277 social entrepreneurs' women's cooperatives (SEWCs). Heifer Nepal has also worked with farmers to develop roughly 18,000 hectares of fodder and forage crops. During the past six years, Heifer Nepal estimates that the incomes of families involved in their projects have increased by an average of 190 percent.⁴

With its official presence in Nepal stretching back 27 years, Heifer Nepal considers that it is well-positioned to facilitate the *Milky Way* Program. Heifer Nepal highlights its expertise in empowering women and developing smallholder-focused agricultural cooperatives, introducing a range of new technologies to improve farm productivity in the dairy ecosystem and partnership experience with government agencies, businesses and civil society organizations at all levels.

² Internal Heifer Documentation

³ Dairy Sector Strategy – Nepal, April 2020. Commercial Agriculture for Smallholders and Agribusiness (CASA)

⁴ Heifer International Nepal (heifernepal.org)



Minister Chung Hwang-keun of Agriculture, Food and Rural Affairs of the Republic of Korea and Minister Dr. Bedu Ram Bhusal of Agriculture and Livestock Development of Nepal explore the future of dairy farming, celebrating a milestone with the handover of Holstein heifers, marking a new chapter in their agricultural partnership at Nepal Agricultural Research. Photo by Heifer International.

Establishing the South Korean Connection

Heifer's involvement in South Korea began in 1951, during the Korean War, when Heifer International responded to a request for aid from the country. Heifer's then-executive secretary, Thurl Metzger, took a tour of the country to assess its most urgent needs⁵ and determined that the goat population in South Korea had decreased by 50 percent and the cattle population by 45 percent since the beginning of the war.⁶

Working in partnership with the United Nations Korean Reconstruction Agency, Heifer International began planning its first shipment of various types of livestock to South Korea from the U.S. starting in 1952.⁷ Between 1954 and 1976, this included 893 dairy cows and one bull shipped to South Korea — mostly Holsteins but some Jersey cows as well.

In 1962, South Korean President Park Chung Hee determined that the country would focus on developing the dairy industry based primarily on Holsteins. Subsequently, during the 1990s, South Korea established the National Dairy Development Program to fully transform and modernize the industry, which has since become one of the most advanced dairy industries in the world with one of the top yields per cow.

In 2018, the world average annual yield per cow was an estimated 2500 L⁸, compared with 9,816L in South Korea⁹,

10,200L in the US and 7900L in the UK. In Nepal, average yields are approximately 730L per year.

Between December 2022 and April 2023, 100 Holstein heifers, six bull calves and two "super bulls" were sent to Nepal. Director of Heifer Korea Haewon Lee played an important role in rallying the support of South Korean farmers, dairy cooperative members and the Government, and she worked to pull together a team of dairy and husbandry experts to provide advice and technical expertise. Sixty-five heifers between 4 and 6 months old were donated by South Korean dairy farmers whose families had benefited in the past from Heifer's support, while the remaining 35 heifers were purchased with funds raised by Heifer Korea.

The super bulls were a gift from the Government of Korea, which also provided a consignment of frozen Holstein semen for near-term AI use. Donated heifers were subject to a rigorous process of genetic selection based on detailed genetic histories; one of the donated cows has a pedigree record going back 13 generations and all go back at least three generations. The cows' genetic records also were transferred to Nepal.

⁵ <https://www.heifer.org/blog/snapshots-of-development-during-and-after-the-korean-war.html>

⁶ Washington Post story, December 8, 1951

⁷ Internal Heifer Documentation

⁸ UK milk productivity: The global context | AHDB

⁹ Statistics-Dairy-cows.pdf (ciwf.org.uk), 2012

Addressing Socioeconomic Challenges Through Dairy

The Challenge of Outmigration

Nepal has the challenge of feeding and providing livelihood opportunities for a population that has grown from about 14 million in 1975 and to more than 31 million in 2024.¹⁰ Per capita income is the second lowest in the Asian region, above only Afghanistan. According to the World Bank, in 2022 Nepal's GDP per capita in purchasing power parity (PPP) terms was \$4,959, compared to \$9,172 in India and \$8,354 in Bangladesh. For reference, the figure was \$76,320 in the U.S.¹¹

On the positive side, Nepal has made considerable progress in recent decades on key indicators of human health and welfare. For example, life expectancy increased from 43.31 years in 1975 to 71.97 years in 2024¹² while infant mortality fell from 159.8 per 1,000 live births to 22.7 over the same period.¹³ And despite relatively low income per capita, Nepal's poverty rate has fallen dramatically, largely due to substantial remittance flows from Nepalis working abroad and related increases in consumption. National household survey data from the Nepal Living Standard Survey 2022/23 shows a large decline in poverty from 25 percent to just 3.6 percent between 2011 and 2023 (using the 2011 National Poverty Line).

However, as the World Bank points out, challenges remain with the weak labor market and limited social assistance posing significant risks — especially for rural dwellers — during economic downturns and climatic shocks.¹⁴ Outmigration — that is, people leaving Nepal to seek work in other countries — also has significant economic and social ramifications. An estimated 14 percent of the population are currently working abroad, mostly in Malaysia, the six countries of the Gulf Cooperation Council and India.¹⁵ They are driven by poverty and/or the lack of opportunity to make a decent living at home, especially in rural areas where agriculture dominates.

Migrant workers send home an estimated USD 4 billion a year, equivalent to around one-tenth of Nepal's GDP.¹⁶

An estimated 630,000 Nepali citizens received migration permits in 2021/22, of which about four-fifths were for three countries: Saudi Arabia, Qatar and the UAE.¹⁷ Only 8 percent of permits were obtained by women, with the vast majority of economic migrants being young men. This contributes to a lack of available male labor on farms and underlines the importance of focusing on women farmers in rural development initiatives, given that many of these women are leading farm management while male relatives work elsewhere.¹⁸

Outmigration is even considered to be reducing the amount of land that farmers cultivate or use for livestock production. Detailed analysis of Landsat satellite images of Nepal revealed that forest cover expanded from 26 percent in 1992 to 45 percent in 2016, largely because of the abandonment of agricultural land.¹⁹ A study carried out in 2018 found that the areas with the greatest reforestation tended to be those with the highest levels of outmigration.²⁰ Several studies have discovered that families of migrants tend to reduce the area of land they cultivate, either because of the lack of manpower or because remittances make them less dependent on agriculture.

These figures are relevant to the *Milky Way* Program because one of its key impact assumptions is that, by increasing productivity and income potential in rural areas, more young (as well as older) people will opt to remain in their villages rather than go abroad or to cities in Nepal in search of work, leading to increased dairy production.²¹

¹⁰ Nepal Population 1950-2024 | MacroTrends

¹¹ <https://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD?locations=NP>

¹² Nepal Life Expectancy 1950-2024 | MacroTrends

¹³ Nepal Infant Mortality Rate 1950-2024 | MacroTrends

¹⁴ Nepal Development Update (worldbank.org)

¹⁵ <https://www.mideq.org/en/resources-index-page/nepal-brief/>

¹⁶ <https://www.mideq.org/en/resources-index-page/nepal-brief/>

¹⁷ Foreign employment revival | Nepali Times

¹⁸ Note that there are no solid figures for migration to India as Nepalis do not require visas or work permits

¹⁹ In Nepal, Out-Migration Is Helping Fuel a Forest Resurgence - Yale E360

²⁰ An upside to globalization: International outmigration drives reforestation in Nepal - ScienceDirect

²¹ Paudel et al.pdf (forestation.org)

Ideally, the transformation of the dairy sector targeted by the *Milky Way* Program would increase farm incomes enough to provide a viable alternative to outmigration. “If [farming families] can get 30-40,000 Nepali rupees (NPR) a month by producing more milk, people will happily stay in the villages,” asserted Rajendra Prasad Mishra, secretary of the Ministry of Agriculture and Livestock Development (MOALD), during a visit by a Heifer delegation in May 2024. “We need to have better incomes in the countryside to encourage young people to stay.”

Currently, Heifer estimates, a family with one crossbred dairy cow might potentially earn 8-10,000 NPR a month from milk sales if they are indeed selling milk. If they were able to own two crossbred dairy cows improved with Holstein semen, or with only one purebred Holstein, they potentially could earn 40,000 NPR a month or more.²² This impact remains to be determined as the *Milky Way* Program advances and farmer household earnings are tracked over the 10-year program period.

The Nutrition Challenge

Consumption of dairy products is strongly associated with reductions in chronic undernutrition in early life, especially stunting.²³ Poor diets are the root cause of undernutrition in early childhood, accounting for almost half of deaths globally among children under five years of age, as well as poor schooling and cognitive outcomes and lower wages in adulthood.²⁴ Hence there is good reason from a nutritional standpoint to increase the availability of dairy products in a country like Nepal.

The increases in volume and quality of milk products that the *Milky Way* Program aims to encourage can potentially lead to further improvement in the country’s health profile, bolstering an uptrend seen in recent decades. The Nepal Demographic and Health Surveys carried out between 1996 and 2022 show significant improvements in childhood nutrition statistics, but there is still work to be done, particularly in rural areas. The percentage of children under five who were stunted fell from 57 percent to 25 percent, underweight declined from 42 percent to 19 percent and the percentage suffering from wasting declined from 15 percent to 8 percent. Stunted growth is also associated with poor maternal nutrition leading to low birth weight in their newborns.²⁵

Nepal also suffers from a basic milk supply deficit. Furthermore, the poor quality of many domestically manufactured dairy products such as ice cream and yogurt means that many consumers would rather buy imported products from India or elsewhere.²⁶ According to a 2020 study, the average nutritional consumption requirement for milk was 91L per person per year while the country was producing just 79L per person per year, meeting 86.8 percent of demand.²⁷ Presumably, relatively wealthier people — particularly in urban areas — consume far more than 79L of dairy products per person per year while many Nepalis earning meager incomes (of which many live in rural areas) consume far less, however, a rural/urban breakdown of the data was not available.

²² Heifer internal estimates

²³ <https://www.ifpri.org/event/dairy-and-nutrition-global-south-potential-progress-and-obstacles-ahead/>

²⁴ See: The glass of milk half empty? Dairy development and nutrition in low- and middle-income countries. Derek D Headley et al. *Food Policy* 122 (2024)

²⁵ See the following: FR379.pdf (dhsprogram.com); Trends and predictors of inequality in childhood stunting in Nepal from 1996 to 2016. Angdembe MR, Dulal BP, Bhattarai K, Karn S. *Int J Equity Health*. 2019;18:42; Factsheet - 2022 Nepal DHS (dhsprogram.com)

²⁶ Pers Comm: Neena Joshi, Senior Vice President - Asia · Heifer International

²⁷ [CASA-Nepal-DairySector-analysis-report.pdf](#)

How Improved Dairy Farming Can Address Challenges

Although agriculture's share of the national economy declined from 33.2 percent of GDP in 2010 to 24 percent in 2023, it remains important both economically and socially. Agricultural jobs comprised 64.5 percent of total employment in 2020, and 80 percent of Nepali households depended on agriculture for their livelihoods.²⁸

The dairy sector contributes an estimated 63 percent of livestock GDP and 9 percent of agricultural GDP.²⁹ Approximately three-quarters of farming households keep at least one dairy animal, and many have other types of livestock such as goat, sheep and poultry.³⁰ However, only about 14 percent of milk-producing households are both producers and sellers, with the remainder producing milk solely for personal consumption. Thus there is substantial untapped income potential in dairy for farmers.

Buffaloes provide more total milk than cows in Nepal – 1.46 million metric tons in 2021/22 compared to 1.1 million metric tons for cows.³¹ Buffaloes are marginally more productive with average buffalo milk yields per animal at 940L a year, compared to 730L for dairy cows. Buffaloes are also dual-purpose animals, providing many Nepalis with a meat source as well as milk. (Cows, which are sacred in Hinduism, cannot be slaughtered. Around 80 percent of Nepalis are Hindus.) Although buffalo dairy production is not the focus of the *Milky Way* Program per se, particularly on the genetic

improvement side, improved dairy husbandry practices promoted through the program are expected also to impact positively buffalo dairy farmers. The program's reach target of 500,000 dairy animal-keeping households includes those keeping buffaloes as well as those keeping cows.

At the time the *Milky Way* Program was being conceived in 2021 and 2022, indications were that total milk production had been increasing much less rapidly than demand: 5.6 percent a year for production compared to 8-10 percent a year for demand.³² In this period, the estimated daily shortfall between supply and demand was 550,000L, a gap that was forecast to widen over the coming years. The unmet demand was expected to have a real impact on the country, with milk shortages becoming more common, prices increasing and food security being threatened.

The milk sector is highly regulated in Nepal, with the government setting milk prices and controlling the level of imports.³³ The pricing system is often seen as a deterrence for domestic milk producers, and both the Government of Nepal and the *Milky Way* Program aim to create a more efficient marketing environment that provides a fair reward for farmers and others along the dairy value chain and a stable supply of dairy products for consumers.



A local vet inspects the newly arrived Korean Holstein heifers and excited Kamalamai villagers gather to witness this transformative moment for their dairy farming. Photo by Heifer International

²⁸ [https://www.nrb.org.np/contents/uploads/2022/08/Current-Macroeconomic-and-Financial-Situation-English-Based-on-Annual-data-of-2021.22-2.pdf#:text=Share%20of%20agriculture%2C%20industry%20and,%2F22%20\(Table%20\),](https://www.nrb.org.np/contents/uploads/2022/08/Current-Macroeconomic-and-Financial-Situation-English-Based-on-Annual-data-of-2021.22-2.pdf#:text=Share%20of%20agriculture%2C%20industry%20and,%2F22%20(Table%20),)

²⁹ Insight into policy provisions and their gaps for dairy sector development in Nepal - ScienceDirect

³⁰ *Milky Way* Program Documentation

³¹ [Statistical-Information-on-Nepalese-Agriculture-2078-79-2021-22.pdf](https://www.moald.gov.np/Statistical-Information-on-Nepalese-Agriculture-2078-79-2021-22.pdf) (moald.gov.np)

³² *Milky Way* Program Documentation

³³ Milk import ban may be lifted to prevent shortages (kathmandupost.com)

Key Hurdles to Improving Dairy Production

Two primary factors drive low dairy productivity: poor animal nutrition and health and poor animal genetics. As noted above, the average crossbred cow — for example, a Holstein or Jersey crossed with an indigenous breed — produces around 9L a day. If this were to increase by a projected 50 percent under the *Milky Way* Program, average yields would thus rise to around 14L a day. To put these figures in context, high-yielding purebred Holsteins of the type provided by South Korea can produce 32L a day; indigenous cattle such as the dwarf Lulu from the Himalayas produce about 1L a day.³⁴ The aim of the *Milky Way* Program is not to reach the South Korean Holstein output level in the short term. Rather, there will be incremental improvements over time through the insemination of existing breeds with nucleus herd/South Korean bull semen.

Beyond the animal productivity issue, most smallholder farmers are unable or unwilling to invest in practices that would improve productivity due to high production costs, the considerable cost of upgrading dairy parlors and associated infrastructure, and low confidence in the prospects for marketing higher-quality milk. Stretched government support services, including for breeding, are also cited as constraints along with weak farm advisory services and training.³⁵

Also in need of strengthening is the regulatory mechanism in Nepal to control infectious disease epidemics.³⁶ For example, data for a recent outbreak of lumpy skin disease show that by July 2023, 1.3 million cattle had been infected and 47,649 died.

The main causes for widespread diseases are poor farm management and unhygienic practices, an inadequate number of veterinarians, illegal trading in the border areas and insufficient quarantine measures.

Another key concern is the questionable quality of raw milk supplied by farmers to milk processors, who often complain about rapid spoilage due to bacterial contamination.³⁷ Recent assessments suggest that if farmers were to receive higher prices for higher-quality milk, they would be more likely to adopt better biosecurity and husbandry practices. This is why Heifer Nepal is promoting the idea that farmers should be paid not just for the fat content of their milk, as they are at present, but for its hygienic quality: the lower the bacterial count, the higher the price paid.³⁸ One of the objectives for a planned dairy processing center in Sindhuli District's Model Dairy Village is to showcase how high-quality milk can be produced in volume and gain a better price.

One of the most important factors affecting dairy productivity is the shortage of high-quality semen for AI. The Department of Livestock Services (DLS) has invested financial and technical resources in the National Livestock Breeding Programme, but the NLBOs have often been unable to keep up with the demand for high-quality semen.³⁹ The *Milky Way* Program aims to remediate this imbalance.

³⁴ Estimates from Heifer International

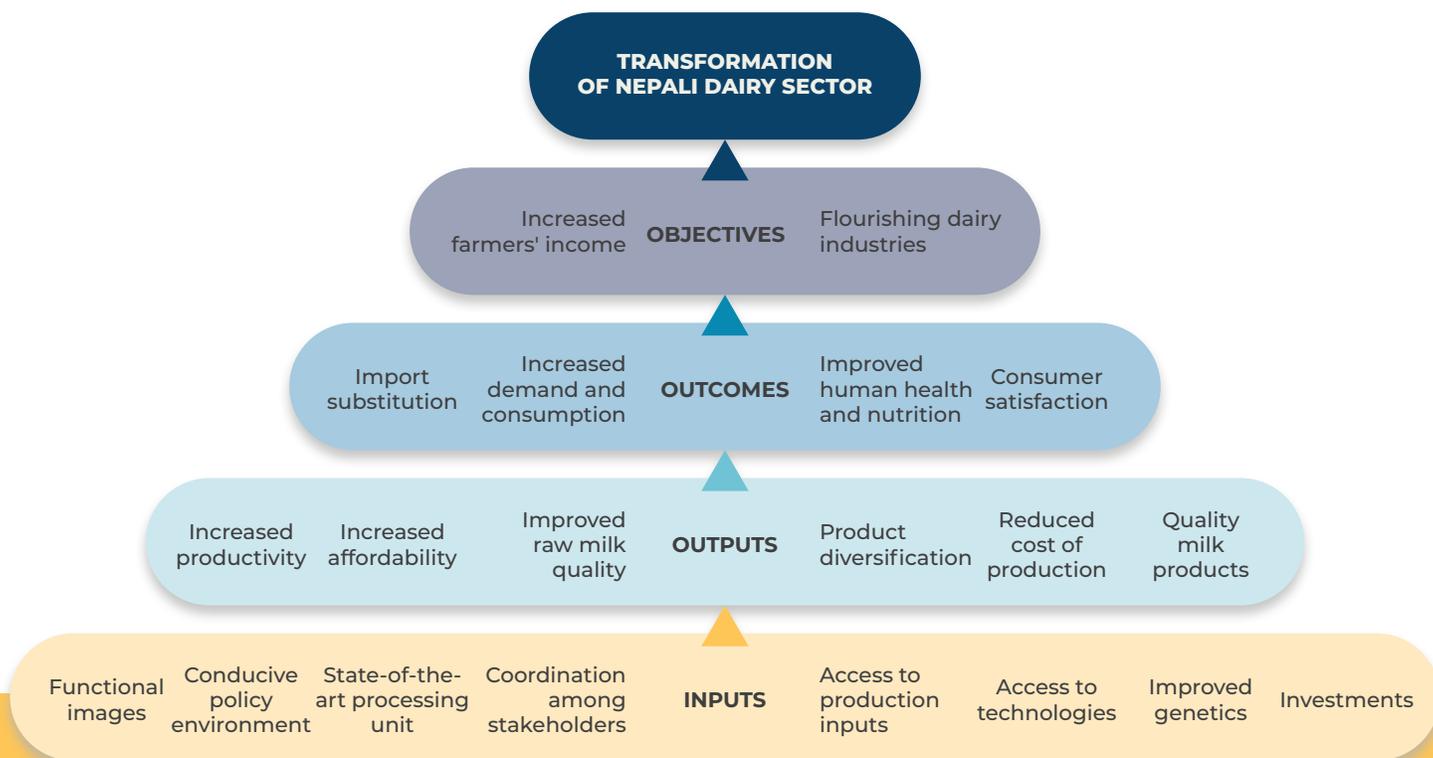
³⁵ Constraints to increasing dairy livestock production also include the large numbers of unproductive dairy animals, with only 16 percent of cows and 32 percent of buffaloes in lactation at any one time.

³⁶ Insight into policy provisions and their gaps for dairy sector development in Nepal (sciencedirectassets.com)

³⁷ CASA-Nepal-DairySector-analysis-report.pdf

³⁸ Pers. Comm. Neena Joshi

³⁹ Information provided by Lahan NLBO staff



The Milky Way Program Approach

The *Milky Way* Program approach is predicated on a theory of change⁴⁰ developed after a lengthy consultation period and in-depth analysis of conditions on the ground.

The theory posits the following:

- ▶ **IF** the genetic condition of the national dairy herd improves;
- ▶ **AND IF** market incentives reward producers for adopting improved animal husbandry practices;
- ▶ **AND IF** the quality of milk and milk products improves through the adoption and scaling up of technological innovations in processing and marketing;
- ▶ **AND IF** the policy, regulatory and business environment currently causing market distortions and low levels of investment improves;
- ▶ **THEN** greater competitiveness will improve profitability and help to sustain smallholder incomes above the living income threshold.

In 2023, Heifer estimated the average “living income gap” for small-scale dairy farmers in Nepal at USD 1,761. This represents the gap between current average incomes and the levels at which farmers are expected to be able to thrive, not just survive, based on what is known as the Anker methodology.⁴¹

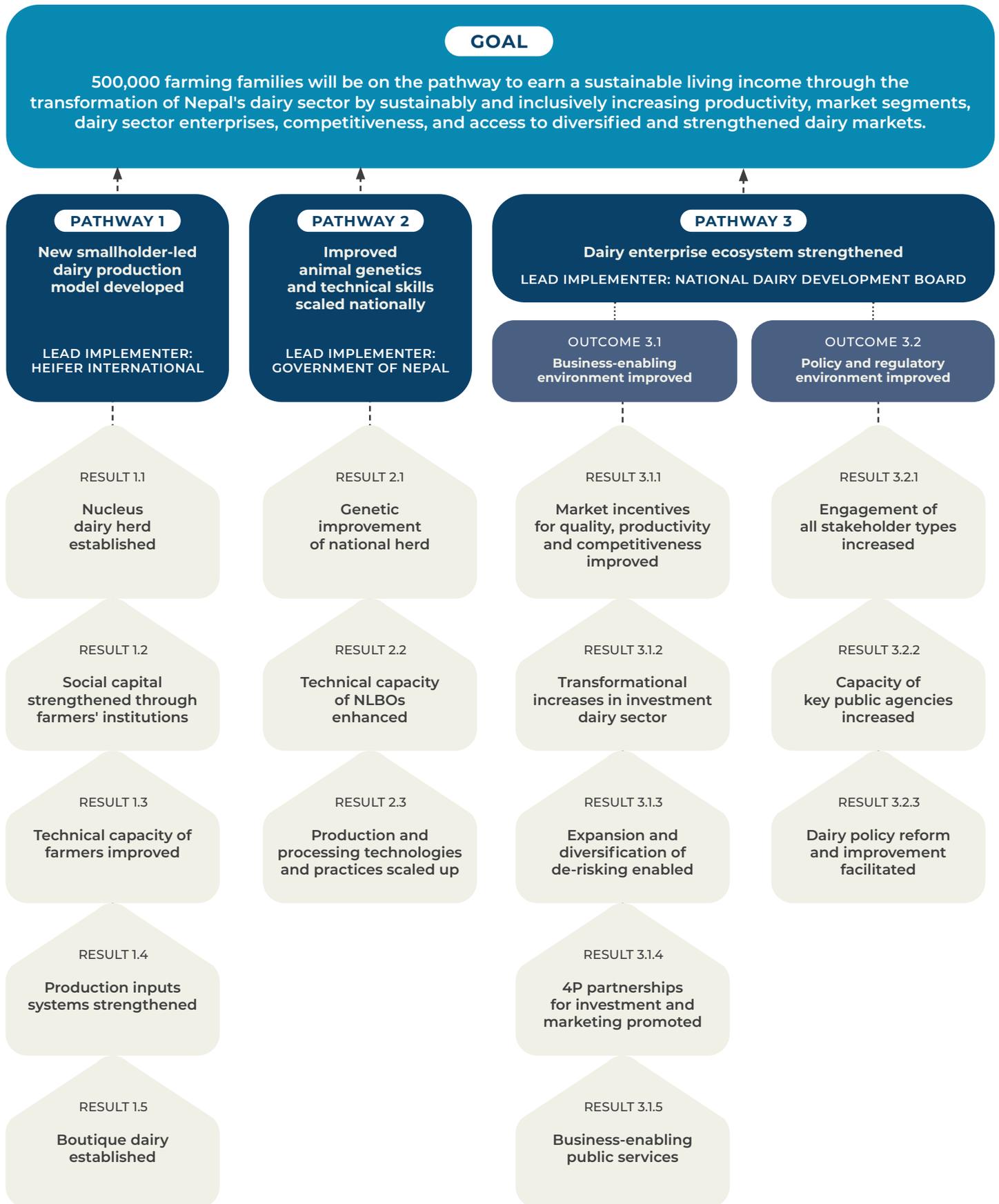
According to assumptions of the *Milky Way* Program, an average smallholder farmer who had a single milking cow in year zero — at baseline prior to participating in the program — and who transitioned to two milking cows crossbred with South Korean Holsteins during the program could conceivably close the living income gap by the seventh year of participation.⁴²

⁴⁰ *Milky Way* Program Documentation

⁴¹ <https://www.ankerresearchinstitute.org/anker-methodology>

⁴² *Milky Way* Program Documentation

The Milky Way Program Results Framework



Milky Way Pathways to Dairy Sector Transformation

The *Milky Way* Program is following three complementary pathways to dairy sector transformation that reflect a systemic approach for sustainable improvement of the sector. The objective of Pathway 1 is to develop a new model for dairy production, piloted in the Model Dairy Village in Sindhuli District, which is a hilly area due southeast of the capital Kathmandu. Sindhuli is well-suited to dairy production with a population of about 300,000 people, most of whom are involved in agriculture.

The MDV is also intended to serve as a center of excellence and learning for farmers and organizations across the country by demonstrating more efficient, hygienic and profitable dairy practices, particularly for smallholder dairy producers, with a strong focus on women farmers. Pathway 1 has been developed and is led by Heifer Nepal and local partners, in cooperation with Nepal's Department of Livestock Services (DLS), and it is targeting 500 local dairy farmers.

Pathway 1 targets five complementary expected outcomes, some of which are already well established. The first involves setting up the nucleus dairy herd based on the South Korean Holsteins. The second involves strengthening the community's social capital by organizing the families into self-help groups and cooperatives, using the community development approach pioneered by Heifer in Nepal. The third outcome will enhance the technical capacity of farmers through the adoption of improved animal husbandry, health practices and climate-smart livestock technologies. Much of this is done through Heifer-promoted farmer field schools. Outcomes four and five of Pathway 1 involve strengthening the input systems for smallholder farmers for animal feed, veterinary services, water and financing, among other things, and establishing a local dairy processing center.

Pathway 2 focuses on scaling up the practices and market systems developed in Sindhuli across the country. This pathway seeks to expand the delivery of improved technical assistance to dairy producers, service providers, and public extension and breeding agency staff throughout Nepal. Among other things, this will improve market incentives for dairy enterprise development, expand farmers' and value chain actors' access to financing, and forge closer partnerships between the public and private sectors.

The *Milky Way* Program sees the model dairy practices developed in Pathway 1 replicated across more than 60 of Nepal's 77 districts, led by the Ministry of Agriculture and Livestock Development and assisted by the DLS and their technical and financial partners, along with additional technical support from Heifer International. This will not include creating similar Holstein nucleus herds elsewhere; rather, the aim is to promote farming practices adopted in Sindhuli and facilitate crossbreeding local breeds with high-quality Holstein semen supplied via AI.

A key component of Pathway 2 is improving the availability of high-quality genetic material across the country. This requires strengthening the technical capacity of the three NLBOs in Pokhara, Lahan and Nepalgunj and disseminating improved genetic material, based on semen harvested from South Korean Holstein bulls in Lahan and Pokhara. Technical capacities to be strengthened include genetic evaluation of cattle; establishing a pedigree performance recording scheme; strengthening the quality of AI services; and improving semen processing. Besides focusing on genetics, the program will facilitate scaling up production and processing technologies in collaboration with national dairy stakeholders under the leadership of the Government of Nepal.

Pathway 3 addresses a range of challenges in the national dairy ecosystem to create a business and regulatory environment that allows Pathway 2 to achieve maximum and sustained impact. To a large extent, this involves strengthening technical and regulatory implementation capacity so that existing policies and regulations are effectively implemented.

The National Dairy Development Board (NDDB) and provincial dairy development boards will take the lead on Pathway 3 through two primary approaches. The first is to improve the business-enabling environment by advocating for a pricing system based not only on milk fat content but also on milk quality – specifically microbiological quality as typically measured by a somatic cell count measuring the level of harmful bacteria in the milk. Having such a pricing system in place will, in principle, help incentivize farmers to produce more-hygienic milk, though it will require time, training and investments across the value chain to implement. This also assumes strong potential for expanding the market for higher-quality milk in Nepal, particularly in urban areas among consumers with higher levels of discretionary income. More generally, Pathway 3 will also facilitate investments in the dairy sector to introduce new technologies and marketing systems.

Managing the Program

This ambitious, multifaceted program hinges on strong commitment, investment and coordination among several public, private, international and civil society partners. Heifer Nepal, the DLS and the National Dairy Development Board are the lead implementing partners, with DLS and the boards operating under the direction of the Ministry of Agriculture and Livestock Development. Heifer has also established partnerships with several government agencies, trade associations, public and private dairy processors, cooperative unions and international development agencies.

Under the guidance of the DLS, the NLBOs will implement Pathway 2 in close partnership with other government agencies and private sector companies. Besides its oversight role for the breeding offices, the DLS played an important role in facilitating the importation of breeding bulls from South Korea. At the local level, the livestock departments in each municipality will lead the dairy development work.

Various departments and teams at Heifer International are engaged in the *Milky Way Program* to ensure sufficient and consistent support to both the government and to farmers in Nepal. Heifer teams are facilitating access for dairy farmers and enterprises to investment capital as well as critical infrastructure such as water and power. Heifer Korea and Heifer Nepal are also facilitating technical assistance from South Korean veterinarians and dairy husbandry experts. Additionally, the program is exploring partnerships with private companies that can supply productivity-enhancing equipment such as milking machines and with food companies potentially interested in purchasing the higher-quality milk and milk products to be produced by domestic smallholder farmers.



Attendees and guests gathered at the Korea-Nepal Model Dairy Village In Kamalamai Municipality, Sindhuli, to cut the ribbon and officially inaugurate the facility on February 13, 2024. From left to right: Deepak Subedi, executive director SIDS Nepal; Dr. Young-Chan Kim, president and chief veterinarian of PAJU Dairy Clinic of Seoul Dairy Cooperative; Dr. Tirtha Raj Regmi, country director of Heifer Nepal; Dr. Rewati Raman Poudel, secretary – Livestock Development, Ministry of Agriculture and Livestock Development; Ambassador Taeyoung Park of the Republic of Korea to Nepal; Mr. Upendra Pokharel, mayor of Kamalamai Municipality; Ms. Haewon Lee, executive director of Heifer Korea; Ms. Neena Joshi, senior vice president of Heifer International; Ms. Yoonhee Chung, deputy director of KOICA Nepal Office; Dr. Umesh Dahal, director general of Department of Livestock Services

Addressing Social and Environmental Dimensions

Gender Inclusivity

Since Nepal became a federal democratic republic in 2008, it has seen improvements in the status of women in some respects, including in the political realm. More than a third of the legislators across the three levels of government — federal, provincial and local — are women, and they have greater decision-making powers both in the home and in society than in the past.⁴³ Nevertheless, societal biases continue to limit women's access to — and control over — resources such as land and capital. The *Milky Way* Program seeks to address gender-based barriers in the dairy sector to ensure that women participate fully in decision-making. For example, in the Sindhuli Model Dairy Village, women have a leading role in both the care of livestock and in establishing women-run self-help groups and cooperatives, as described in the next section of this paper.

Climate and Environmental Sustainability

The *Milky Way* Program also aims to improve the environmental dimension of dairy farming in Nepal through promotion of regenerative livestock husbandry methods which, in principle, will also help reduce the carbon footprint of the dairy sector. To be sure, Nepal is more a victim of climate change than a significant contributor at this point — the country's greenhouse gas (GHG) emissions were 0.027 percent of total global emissions in 2020.⁴⁴ Nevertheless, the Program acknowledges the role that livestock play in these emissions: globally, agriculture accounts for 14.5 percent of anthropogenic greenhouse gas emissions, with about two-thirds coming from livestock production. Almost half of the livestock contribution is in the form of methane, one of the most potent greenhouse gases, and 39 percent of this derives from enteric fermentation in ruminant livestock like cattle.⁴⁵

Technical knowledge of climate-smart agricultural techniques in Nepal is quite low among most farmers, while access to energy-saving, resource-reducing technologies is also limited. The *Milky Way* Program will address this issue wherever possible, in large part through improved productivity. Emissions intensity — the amount of emissions produced per unit of milk or meat — tends to decrease with increases in productivity. For example, research in East Africa has shown that dairy cows producing 1,000L of milk in a 10-month lactation period produce four times more methane per unit of milk than dairy cows producing 2,000L of milk per lactation.⁴⁶ By increasing productivity, the *Milky Way* Program will reduce emission intensity, if not the volume of emissions. At the same time, training farmers in better feeding practices; supporting them to grow fodder crops that help reduce methane emissions from enteric fermentation and improve soil health; and introducing more efficient manure management will help dairy farmers reduce their carbon footprint while also improving environmental status on the farm and adjacent areas.

⁴³ Improved Status Of Women In Republic Nepal (risingnepaldaily.com)

⁴⁴ Nepal First NDC.pdf (unfccc.int)

⁴⁵ A NEW NARRATIVE FOR AFRICA'S LIVESTOCK.indd (cgiar.org)

⁴⁶ A NEW NARRATIVE FOR AFRICA'S LIVESTOCK.indd (cgiar.org)

The *Milky Way* Program Progress Report

Status of the South Korean Holstein Cows

Immediately after their arrival from South Korea in four shipments during late 2022 and early 2023, 100 heifers, six bull calves and two super bulls all spent several days in quarantine at the Nepal Agricultural Research Council (NARC) office in Khumaltar, in the Kathmandu Valley, before transfer to their final destinations in the Model Dairy Village (MDV) or one of the National Livestock Breeding Offices.

Eighty heifers were dispatched to Sindhuli District and distributed among 51 smallholder farming households. The other 20 heifers were distributed among four government facilities: nine to the NLBO in Pokhara; four each to research stations in Jiri and Chitwan and three to the NARC in Khumaltar.⁴⁷

The six bull calves — five Holsteins and one Jersey — were sent to the Pokhara NLBO and the two mature bulls sent to the NLBO in Lahan, where they are already providing high-quality semen for AI services. The overall distribution of the animals — with some placed in lowland areas and some in middle hills — allows scientists to study how these imported cows adapt to different conditions, especially to varying levels of heat, altitude and humidity.

The Lahan NLBO occupies 10 acres in Sihara District, in the low-lying Terai to the north of the border with India. In May 2024, officials there said the NLBO was home to 33 semen-producing dairy bulls and buffaloes, including 10 Holsteins and nine Jerseys. The expected total AI output for 2024 was 430,000 shots of semen, up from 310,000 the previous year. Around half of this was expected to come from Holstein bulls, including the two recently acquired from South Korea.

“The *Milky Way* Program will help to improve the quality of semen we provide,” said Office Chief Shiva Nath Mahato during an interview conducted on 30 May 2024. He said he believes that the Lahan NLBO could also be the ideal place to establish a facility to produce sexed semen, enabling farmers using AI to choose semen to produce female calves.

A considerable amount of preparatory work took place before the livestock arrived in Nepal. Over a period of a year, Director of Heifer Korea Haewon Lee and a team of South Korean experts visited Sindhuli District on multiple occasions to conduct a feasibility study to assess whether this would be an appropriate destination for pedigree Holsteins.

The area had already been independently identified by the Japanese International Cooperation Agency (JICA) as ideally suited to dairy farming.⁴⁸

The Heifer and South Korean teams also concluded in the affirmative, prompting the decision to establish the nucleus herd and MDV in Kamalamai, the district capital.

The South Korean cows arrived safely to Nepal with no mishaps during transit, and they appear to have largely thrived so far in their new conditions.⁴⁹ The great majority of the heifers were soon in calf following AI with semen from South Korean pedigree bulls.

Before the launch of the program, there were lengthy discussions about who should host the heifers, with some experts arguing that government facilities were preferable for a high-input/high-output breed like the Holstein, given the government facilities’ long experience and infrastructure. Eventually, the decision was made to share responsibility, with the smallholders taking four out of every five heifers.

This smallholder-focused model also aligned with the Government of Nepal’s agricultural development strategy, which identifies dairy as the second most important agricultural value chain for investment and prioritizes smallholder-focused approaches.⁵⁰

“Heifer International has worked with smallholder farmers for a very long time,” said Heifer Senior Vice President for Asian Programs Neena Joshi, “and we have found that if you choose the right recipients and provide them with the right knowledge, they are the ones who can manage animals the best.” She believes this has been confirmed by

⁴⁷ NARC, in collaboration with Heifer Project International Nepal (HPIN), Heifer Korea, the Department of Livestock Services (DLS) and the National Dairy Development Board (NDDB), is implementing the *Milky Way* Program.

⁴⁸ 1 (jica.go.jp) Ministry of Agriculture Development (MOAD) Nepal THE PROJECT FOR THE MASTER PLAN STUDY ON HIGH VALUE AGRICULTURE EXTENSION AND PROMOTION IN SINDHULI ROAD CORRIDOR IN NEPAL (SRCAMP) Final Report Volume I Main Report March 2014 Japan International Cooperation Agency (JICA) KRI International Corp.

⁴⁹ Neena Joshi, pers comm.

⁵⁰ <https://faolex.fao.org/docs/pdf/nep171433.pdf>

the generally positive health and welfare to date of the South Korean heifers in Sindhuli District.

Joint Secretary of the Ministry of Agriculture and Livestock Development Dr. Rajendra Prasad Mishra affirmed that placing the cows with smallholder farmers had been a success so far.

“Up until now, the cows are performing very well and are in good condition,” he said at a meeting with a Heifer team on May 2024. Dr. Mishra added: “This is a milestone for our country’s dairy sector development.”

The choice of which households receive the heifers was based on several criteria, including proven competence with existing livestock and prior track record in managing crossbred dairy animals. All the recipient households have also received ongoing technical support in maintenance and care of the cows, veterinary support, developing sheds and

infrastructure required for a high-yielding breed like the Holstein and growing or sourcing quality fodder crops.

Midway through 2023, not long after the heifers were placed with families, the lumpy skin disease outbreak occurred and posed a major health challenge.

Approximately half the heifers in Kamalamai contracted the virus but thanks to prompt care from both the farmers and the *Milky Way* veterinary staff, only six succumbed. The government research and breeding stations lost two of their 20 South Korean heifers to the disease.

Of the 92 South Korean heifers that survived, 91 were inseminated with Holstein semen provided by the Government of Korea and over 95 percent of these became pregnant.⁵¹ By the end of May 2024, 15 cows had calved successfully, and the remainder were expected to calve by mid-September 2024.

Holstein Heifer Management in the Model Dairy Village

The concept of the Model Dairy Village is exactly that — to create a model. “The plan is to have a uniform system in all 500 households in Kamalamai Municipality of Sindhuli District, with the same [animal] management,” said Keshav Sah, director of the *Milky Way* Program. “It requires a lot of time and a lot of commitment from the smallholders.”

A good insight into how much time and commitment is needed and the importance of adopting new husbandry practices for a high-yielding breed like Holstein is evident when visiting the farmers currently involved in the program. Rukmani Adhikari and her husband Madhav were gifted two South Korean heifers in December 2002 and named them Ramni and Tika. Ramni gave birth to a heifer calf in late May; Tika was expected to calve three weeks later.

The shed housing their Holsteins is far superior to the one in which the family had raised crossbred dairy cows. The shed has a sloping concrete floor so that urine runs off for collection in a gutter. The cows have rubber mats to lie on and at one side is a row of concrete mangers so that each cow has access to a manger with fodder and a manger with water.

A second loft level of the shed stores bales of hay and fodder. Two electric fans help keep the cows cool in hot weather.

The milking system used by Mrs. Adhikari is more complicated than the one she uses for crossbred cows. With the latter, she allows the calf to suckle very briefly before milking the cow and then allows the calf to suckle again afterward. Before milking, she cleans the cow’s udder and then milks the cow by hand. (Note that there are plans to introduce mechanical milking machines in the village, but as of May 2024 this was not fully developed.) When she is finished, she dips the cow’s teats in an iodine solution to prevent mastitis. Each day, she calculates how much milk the calf needs, based on its weight. In the early days, she was giving Ramni’s calf 4L a day in four sessions. Immediately after calving, Ramni was producing 21L of milk a day. Mrs. Adhikari expected this to rise to 30L.

Besides changing her milking regime and providing better housing facilities for her new cows, Mrs. Adhikari has also had to think more carefully about how she feeds them. Technical advisers have provided her with a list of the various feed components for optimal nutrition and digestion — silage, hay, grain, concentrate, straw — and the quantities she should give.

“I am confident that these cows will help to transform our lives,” she said.

⁵¹ Nepal: Baby Cows, Big Dreams | Heifer International

Addressing Husbandry Challenges

Mrs. Adhikari acknowledged some initial challenges to managing these high-quality cows, but she and her husband have been able to address them. “My cows have not been much trouble, and we have had no major problems,” she said. Her neighbor Mrs. Shanta Thapa, who also has two South Korean heifers, said she hadn’t been sure whether the cows would tolerate high temperatures, sometimes as high as 40°C, but they seem to have coped well. Initially she was also provided with a supply of imported South Korean feed mix designed for Holstein cows but when she ran out, one of the cows refused to eat for several days. Gradually, however, she got the cow onto a new diet of local fodder, silage and concentrates recommended by *Milky Way* staff. She has had some problems with the cows’ health, including fevers and lumpy skin disease, but prompt veterinary care has helped her cows recover.

Deepak Kumar is chairman of Sindhuli Integrated Development Services (SIDS), the local nongovernmental organization responsible for working with local communities in the *Milky Way* Program. He said that when the idea of introducing Holsteins was first raised, many smallholders were daunted by the technical demands of looking after a high-input/high-output breed. Prior to the arrival of the cows, SIDS and its partners held numerous planning meetings with the women farmers who would take charge of the cows, and the meetings included the women’s husbands. Gradually, the smallholders bought into the idea and became enthusiastic about the potential income the cows could generate.

Besides the problems caused by lumpy skin disease, several other diseases pose a threat — though this is by no means specific to the South Korean cows in Nepal, since all cow breeds periodically face health issues. According to Dr. Doj Raj Khanal, director of Livestock and Fisheries Research at the NARC, some of the South Korean cows arrived with a fungal skin disease that had not been seen before in Nepal. The South Korean vets said that it would disappear as the cows aged, and this proved to be the case. There was also no evidence at that time of the skin disease transmitting to indigenous breeds. Exotic breeds such as Holsteins tend to be more susceptible than indigenous breeds to many diseases including theileriosis, a tick-borne disease caused by protozoan parasites of the genus *Theileria*.⁵² Dr Khanal believes this could be a challenge in the future for purebred

Holsteins in lowland areas, and *Milky Way* veterinary staff are planning for potential responses.

On the input side, Holstein dairy cows require more fodder and water than crossbred or indigenous cows; equally, the more Holstein genes there are in a crossbred cow, the greater will be its fodder and water requirements. As of the time of writing, farmers in the MDV were relying on groundwater sources — enough to satisfy the cows’ needs but not enough to also irrigate the required fodder crops they are supposed to grow. Farmers need more water, and a survey commissioned by Heifer Nepal identified a source of spring water in the general area that could yield 100,000L a day for the community.

Since the farmers in Kamalamai don’t yet have sufficient homegrown silage, many are purchasing it from a silage plant in Hetauda, about 100 kilometers away. To tackle both the shortage of water and silage, *Milky Way* partners have developed a plan to raise funds to support development of and delivery from the spring water source as well as the establishment of a silage facility in Kamalamai itself. The municipal authorities have already designated a parcel of land where the latter could be established.

In principle, about half the first generation of *Milky Way* calves will be heifers and half bull calves. Once they have been weaned, the first-born of the former will be given free — passing on the gift — to other smallholders in the community, eventually reaching the targeted 500 families. Once farmers with heifers have gifted one calf, they may retain subsequent offspring for themselves or sell them. As for the bull calves, *Milky Way* staff said the best 20 to 50 percent of the first generation — based on their assessed reproductive potential and NBLO’s genetic material needs — will be sent to the NLBOs where they will be reared to provide semen for AI.

To reduce the quantity of surplus bull calves, the Department of Livestock Services in coordination with Heifer Nepal is looking at ways to introduce a sexed-semen system allowing farmers the choice of having their cows served with semen yielding primarily female offspring. Sexed semen currently is not produced in Nepal but the government is investigating ways to establish a system to produce sexed semen. However, this is costly as it involves use of foreign-owned proprietary technology.

⁵² Theileriosis in Animals - Circulatory System - MSD Veterinary Manual (msdvetmanual.com)

Providing Technical Support to Farmers

As noted, the MDV will become a center of excellence and learning, not just for farmers in Sindhuli District but for farmers across Nepal. At the heart of its success will be the technical support provided by a range of experts from South Korea and Nepal as well as from Heifer International and SIDS, through teams of technicians working on the ground with smallholder farmers in Kamalamai.

South Korean partners will continue to play a role. "Right from the beginning, South Korean technical assistance has been very important, and it will continue to be important over the coming years," said Senior Vice President of Asia Programs at Heifer International Neena Joshi. "The project has benefited from their expertise in genetics, veterinary care and all aspects of animal husbandry."

The MDV receives regular visits from South Korean experts with specialized knowledge of Holstein genetics, feeding regimes and animal health. They provide advice and guidance to technicians working for Heifer International and SIDS, and to the farmers themselves. Technical assistance has also come in the form of equipment. For example, at a ceremony held at the municipal mayor's office in Kamalamai in May 2024, the Paju Dairy Clinic of Seoul Dairy Cooperative donated ultrasonic pregnancy diagnostic equipment for use in the MDV. This will make it far easier for Nepalese vets to establish early on whether cows are in calf and provide appropriate veterinary support.

The South Korean experts and their Nepali counterparts are also available for pressing animal care issues. For example, if a farmer has a sick cow, they first contact a veterinary technician at SIDS. If the SIDS technician can identify the problem, they will tell the farmer how to treat it. However, if the SIDS technician determines that it may require a more advanced level of technical knowledge, they will record the symptoms, take blood samples and the animal's temperature, and then post photographs or videos to a WhatsApp group whose members include *Milky Way* Program staff and national veterinary experts who can suggest treatments.

The availability of quick and efficient advice is greatly appreciated by the farmers. "I feel very lucky to have [24/7] technical assistance," said Shanta Thapa, secretary of the Kamalamai Social Entrepreneurs' Women's Dairy Cooperative, who has South Korean cows. She has called on the services of

Milky Way experts for a range of animal health problems, including lumpy skin disease.

She and other farmers have also been assisted by a Heifer engineer based in Kamalamai. He is closely involved in the farmer field schools and advises farmers on all matters related to infrastructure and the modernization of their dairy units, especially the cow sheds and associated structures, such as fenced paddocks, urine collection pits, foot baths, water tanks and biogas units.

Heifer's program manager in Sindhuli District works closely with SIDS to implement a wide range of activities, from sourcing silage and concentrates to running the farmer field schools. The 51 families with South Korean cows have received monthly training at the field schools, attending in four different self-help groups. The 90-minute field school sessions generally follow a savings and credit meeting at which members make small contributions – say 100 NPR – and eventually receive a loan out of the savings that accumulate.

The topics for the field schools vary from month to month but are typically related to testing and improving overall animal health and husbandry practices. The farmer field schools also focus on the fodder crops, which are an important part of the Holstein cows.

"In winter, we talk to farmers about how to cultivate oats and berseem," explains Dr. Sharma. "Oats are a good high-energy crop, while berseem, an Egyptian clover, is high in protein."

In summer, the farmers learn about the best ways to cultivate teosinte, a relative of maize, and legumes like cowpeas, which provide the cows with protein. The field schools also teach farmers about the importance of maintaining soil fertility and using their cattle dung and urine effectively.

DLS, Heifer International Nepal and the CGIAR's International Livestock Research Institute (ILRI) have recently begun collaborating on the Africa/Asia Dairy Genetic Gains (AADGG) project. This will leverage information and communication technologies and genomic advancements to accurately profile, evaluate and rank dairy bulls and cows, to help identify the bulls and bull dams – mothers of bull calves – for breeding future national dairy herds.

To be sure, the success of improved breeding also depends on collecting regular and relevant data about the Holstein heifers, which the smallholder dairy farmers are expected to record and share. Farmers participating in the *Milky Way* Program have learned how to keep track of their animals' growth, development, health and feeding regimen. At the time of writing, this was being done manually in ledgers but there were plans to introduce a mobile app for data recording. According to Heifer Nepal, a majority of households in the MDV own at least one smartphone and thus would be able to use it for dairy data management.

Technical assistance from the *Milky Way* Program is not only directed at farmers; experts also engage a wide range of value chain actors. For example, Heifer holds frequent workshops for district inseminators to strengthen the quality of AI services. These will become increasingly important as high-quality Holstein semen is disseminated throughout the country. Heifer is providing ongoing technical support for genetic evaluation of the dairy animals such as application of data analysis software (ASREML-R), organizing training to NARC and DLS Animal Breeders on genetic data analysis and evaluation, and planning activities for scaling up good husbandry and managements practices and climate friendly technologies throughout the country in collaboration with Central Dairy Cooperative Association of Nepal (CDCAN), NDDDB, PDDB and local government



South Korean Veterinarian, Dr. Junhee Kim, gives a practical lesson on biosecurity and animal health management to members of the Sindhuli Farmer Field School in Nepal. Photo by Heifer International

The Essential Role of Financing

To be sure, this support, equipment and training all come at a cost, which is currently borne by Heifer entities and the municipality along with limited donor funds and pro-bono assistance from South Korean experts. The ultimate objective is to make improved dairy production self-sustaining, with Nepali government bodies providing regular support, and value chain investments made by private sector actors.

“Over time, Heifer will phase out” its financing of the program, said Program Director Keshav Sah. “We’re also telling the farmers, ‘This is not a Heifer Project, or a Ministry project, or a Municipality project – it is your project.’ That is why we want them to commit to it.” The commitment comes not just in terms of raising livestock and creating the Model Dairy Village, but in sharing some of the costs. For example, the costs of shed construction, chaff cutters, water tanks and stands – which represent some of the more significant capital expenses of the Model Village approach – are divided between Heifer, donor organization like South Korea’s Korea International Cooperation Agency, Kamalamai Municipality and the farmers.

This has raised the issue of ensuring that the farmers have access to sufficient and affordable financing to cover costs until the Holstein heifers reproduce and subsequently start to yield increased quantities of milk to sell and hence produce

income – a delay that can be a year or even longer.

Heifer International has been working closely with a local branch of the national Agricultural Development Bank (ADB) in Sindhuli District to arrange concessional loans for farmers.

The ADB believes that providing loans to the *Milky Way* farmers makes good financial sense. “We feel secure when it comes to financing the farmers and are comfortable about giving loans to this program,” said Tek Karka, manager of the ADB in Kamalamai, during a visit by a Heifer team in May 2024. He said that as of mid-2024, the ADB will have provided loans worth NPR 9 million to five farmers involved with the *Milky Way* Program. Some have used these to buy additional crossbred Holstein cows; others have used loans for equipment, infrastructure or to buy seed to plant fodder crops.

At the time of the visit to ADB in late May 2024, Karka said a further six farmers were in the process of applying for loans and drawing up business plans with the help of community-level bank facilitators supported by Heifer. Karka said the annual interest on these ADB-facilitated loans is 9 percent compared to the typical 14 percent charged by commercial banks or microlenders in the area. He said the ADB is able to offer cheaper financing because it is in turn supported by low-interest financing from the International Fund for Agricultural Development (IFAD).

The Cooperative: A Critical Node

The Kamalamai Social Entrepreneurs’ Women’s Dairy Cooperative was established in early 2024 and is poised to play a major role in the development of the MDV. Over time, the cooperative will evolve into a genuine business hub, providing farmers with business development services; facilitating access to inputs, veterinary care, livestock insurance, access to financing, etc.; running the milk collection center and ensuring that cooperative members produce high-quality milk and deliver it to the collection center. The cooperative will also play a leading role in managing the dairy processing center and marketing milk and dairy products.

As of late May 2024, the cooperative had 52 members. The cooperative chair, Mrs. Guna Kumari Ghimere, said at the time that she expected membership to reach 500 by the end of 2024. “One of our main objectives is the empowerment of women,” she said. Before joining the cooperative, prospective members undergo a training exercise based on Heifer’s set of 12 core values known as the Cornerstones for Just and Sustainable Development to help build social capital in the group through increased mutual trust, accountability and inclusivity. The training also focuses on practical aspects of working in a group, the care of livestock, essential business and trade skills, and the importance of passing on the gift.

According to Mrs. Adhikari, who is also a cooperative board member, the process of establishing self-help groups and the cooperative have significantly boosted the confidence of the women farmers involved and their willingness to launch collective enterprises.

“Before Heifer came, we were very shy, we couldn’t even introduce ourselves in meetings,” she recalled. “Heifer taught us that you need to come out of yourselves and communicate with visitors. So, we formed self-help groups [and the cooperative]. We

now feel empowered and much more confident.”

Mrs. Adhikari said the income from the Holsteins will mean that women no longer have to ask their husbands for money whenever they need it. “[The women] will be able to pay for their children’s schooling and buy groceries,” she added.

Although the self-help groups and cooperatives are run by women, care has been taken to make sure that men are not excluded — and are in fact strongly integrated in a family-focused approach. “I’m totally with my wife on this journey,” says Mrs. Adhikari’s husband, Madhev. He said he is happy to do the heavy lifting, such as taking the milk to the collection center, and if his wife is attending a training session or a meeting of the cooperative, he looks after the cows.

At a meeting with some 25 cooperative members in May 2024, many highlighted the ongoing challenge of outmigration — particularly by working-age men — which leaves many of the women largely responsible for farm activities. However, the members expressed confidence that, assuming higher-productivity cows lead to significant gains in smallholder incomes, the *Milky Way* Program will encourage more men (as well as younger women) to remain in the community. “The reason people leave is to make money,” said one member. “If we can create jobs and opportunities here, it will be an incentive to stay.”

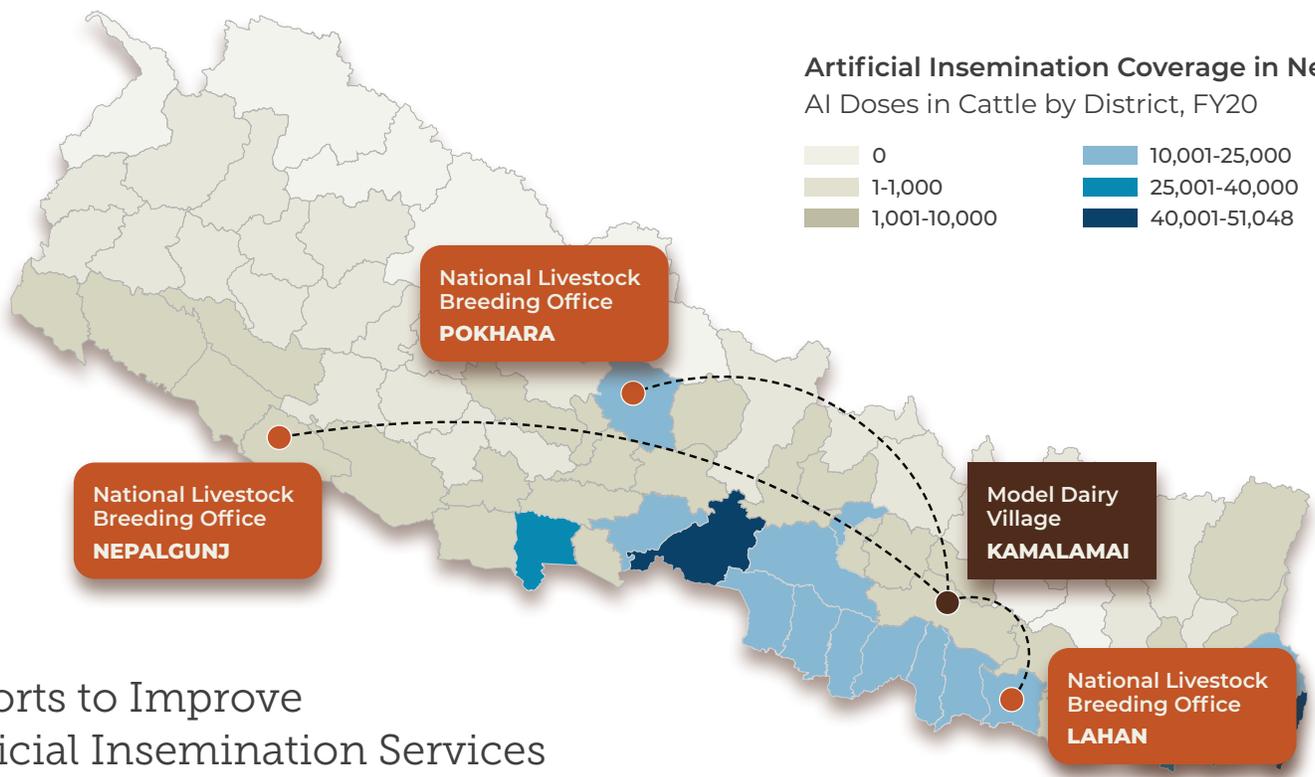
Local Heifer staff and farmers said locally available crossbred cows are currently earning their owners around 8,000-10,000 NPR a month while a purebred Holstein or two crossbred cows with Holstein genetic material can bring in about 40,000-50,000 NPR a month. Furthermore, the program is not only encouraging farmers to acquire higher-yield dairy cows, but also to increase the number of cows they have as they improve their husbandry and business skills.



Korean experts sharing valuable techniques with women self-help group to help them raise Korean Holstein heifers, improve their dairy farming skills, and support community growth. Photo by Heifer International

Artificial Insemination Coverage in Nepal

AI Doses in Cattle by District, FY20



Efforts to Improve Artificial Insemination Services

Improved AI capacities are a linchpin for the program. The two bulls at Lahan NLBO had produced 50,231 doses of semen by the end of May 2024. Of the six Holstein bulls at Pokhara NLBO, collection of semen from one had just begun at that time while three more were ready to begin doing so and two were still underage. According to Senior Livestock Development Officer at the Lahan National Livestock Breeding Center Nath Mahato, South Korean Holstein semen is shown to be very high quality, even better than that from American Holsteins, which were already present at the breeding station. He said the high temperatures in the Nepali lowlands (where Lahan is located) have not adversely affected semen quality or quantity. At that point, 100 doses had been used in a field trial while the rest were in cold storage. Decisions about where to use the semen would be taken once the trial concluded.

The national demand for semen is estimated at 700,000 doses a year, which would require approximately 60 high-performing bulls.⁵³ Most AI bulls have a working life as semen suppliers of six to seven years. To ensure sufficient supply, Mahato said some 15 new bulls must come on stream every year. The nucleus herd in the MDV will thus become a significant source of new high-genetic-worth Holsteins.

To maintain the nucleus herd until the South Korean Holstein bulls in Nepal reach full production level, cows in Kamalamai will be inseminated with Holstein semen brought from South Korea and supplied from five unrelated South Korean bulls to avoid possible inbreeding issues. Farmers in Sindhuli District and elsewhere will also be able to use pedigree Holstein semen to bolster the productivity of their crossbreed cows.

Indeed, at the national level, the primary impact for increased milk production will come from higher-yielding crossbreeds rather than pedigree cows. As a result, productivity of cows in most of the country will gradually reach higher levels as successive generations of heifers have progressively higher proportions of Holstein genes.

The Jersey cow, a genetic native of the British Channel Islands, is another high-performing breed that has been imported and widely used in Nepal. Jersey cows are smaller than Holsteins, tolerate heat well and produce milk with a high fat content (around 5 percent compared to 3.5 percent for most whole milk). Jersey milk also has 18 percent more protein and 20 percent more calcium than milk from most other breeds.⁵⁴ Jerseys and Jersey crosses are well-suited to the climate and topography in Nepal, and the breed is well represented in the NLBOs. At Lahan, for example, there are nine Jersey bulls and 10 Holstein bulls.

Discussions were under way between partners involved in the *Milky Way* Program about the possibility of establishing a Jersey nucleus herd, managed along the same lines as the Holstein nucleus herd in Sindhuli District, in some other part of Nepal. However, this would not involve importing live animals but the use of imported pedigree embryos and semen. Some farmers may prefer to develop Jersey crossbreeds rather than Holstein crossbreeds because the former are smaller, easier to handle and less expensive to feed. At present, dairy farmers in Nepal are paid 7.5 NPR per liter for every 1 percent of fat content. This means that Jersey milk could feasibly generate more income per unit of milk output.

⁵³ Theileriosis in Animals - Circulatory System - MSD Veterinary Manual (msdvetmanual.com)

⁵⁴ Jersey Cow Milk | Fact, Buying Guide & Production in Texas | TexasRealFood

Conclusion and Next Steps

In Sindhuli District, the *Milky Way* Program will continue to build on the progress already made in establishing the Model Dairy Village and the center of excellence and learning. In the meantime, partners have taken first steps to develop Pathway 2, which focuses on improving livestock genetics, enhancing the technical capacity of NLBOs and scaling up the production and processing technologies, which will help to transform the dairy industry.

Pathway 2, led by the Department of Livestock Services (DLS), involves selecting and managing bull calves for semen delivery; establishing a national pedigree performance recording system (PPRS) digital platform; introducing a software system to analyse the data collected. This pathway will also investigate the possibility of setting up an in-country embryo transfer system.

Planning for Pathway 3, which aims to strengthen the dairy enterprise ecosystem, is getting underway, led by the National Dairy Development Board (NDDB) at central level and PDDB at province level. Memoranda of Understanding (MOUs) will be established between the Provincial Dairy Development Boards (PDDB) and Heifer International Nepal. The first of these will be with Madesh Pradesh Province in the densely populated Terai. Activities under this pathway include developing market incentives to reward farmers producing high-quality milk; increasing investment in the dairy sector; encouraging diversification; and developing an enabling environment for business. Pathway 3 will also look at improving the policy and regulatory environment.

The *Milky Way* Program seeks to bring about fundamental changes in Nepal's dairy sector in a relatively short period of time (10 years). The focus is on helping smallholder farmers improve their productivity and incomes given that the large majority of farming activity in Nepal is at the smallholder level. Given the right encouragement and technical help, it is hoped that smallholders will be the drivers of change.

Women farmers are playing a leading role in establishing the MDV. A women-led cooperative in the community will be a key player, eventually acting as a business hub for collecting, processing and marketing milk.

So far, the project has focused on using high-yielding Holsteins to improve the genetic status of Nepal's dairy herd. There are now plans to do the same with Jersey cows, which have different attributes well-suited to parts of the country.

If the *Milky Way* Program leads to greater availability of affordable high-quality dairy products, this could also greatly improve the nutritional status as well as support in import substitution of dairy products. By increasing incomes and creating new businesses in rural areas, the *Milky Way* Program could encourage young people to stay in their villages rather than go abroad in search of work.

The success of the *Milky Way* Program will depend on developing markets and generating demand for high-quality milk and milk products. The program should help the country reduce imports of dairy products and increase exports.

Newly arrived Holstein heifers from Korea at Kamalamai, Sindhuli, settling in the field as they prepare for their new homes after a long journey. Photo by Heifer International.





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