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Impact of Dairy Science Park on the Lives of the People, the Climate, and the Eco-Security Conditions

Muhammad Subhan Qureshi[1], Eman ul Haq Qureshi[2] and Irfan ul Haq Qureshi[1,3]

[1] Dairy Science Park, 23-A, Industrial Estate, Hayatabad, Peshawar-25000, Pakistan
[2] Economics Department, Institute of Management Sciences, Hayatabad, Peshawar-25000
[3] MBA Global Program, University of South Wales, USK Way, Newport, NP20 2BP, United Kingdom

Summary

Since its establishment in 2011, Dairy Science Park (DSP) has emerged as a transformative force in the livestock sector across Pakistan and neighboring regions. Founded by Prof. M. Subhan Qureshi, DSP bridges academic innovation with real-world applications—generating income, creating jobs, and advancing environmental sustainability. Through its Triple Helix Model, linking academia, industry, and government, DSP has translated research into action, directly benefiting over 20,000 individuals, including farmers, youth, women, veterinary professionals, students, and entrepreneurs.

DSP has driven the development of climate-smart livestock systems through the establishment of Technoparks, business incubation platforms, quality assurance labs, and applied research hubs. These innovations have not only strengthened animal health and food security, but also significantly contributed to climate resilience.

DSP's strategy for climate change mitigation includes improved livestock practices, methane reduction, biogas systems, and renewable energy. Together, these interventions have resulted in a measurable reduction of 47,138 tons of CO_2 emissions. Startups such as GreenWend Energy Pvt Ltd and SunSaviour have delivered over 49 million kWh of clean electricity to off-grid communities.

In addition to climate mitigation, DSP has had a wide-ranging societal impact, including enhanced health services, increased food production, and improved energy access. With strategic partners like FAO, ITC-UN, ISN Beijing, and Pakistan's Ministry of Science and Technology, DSP is advancing toward the establishment of a National Eco-Security Commission. These efforts form a replicable, inclusive model of sustainable development to address urgent challenges like climate change, food insecurity, youth unemployment, and rural underdevelopment.

Keywords: Dairy Science Park, Eco-Security, Climate, Sustainable Development, Renewable Energy, Environment, Food, Health

1. Improved people's lives

Since its inception in 2011, the Dairy Science Park (DSP) has significantly enhanced the livelihoods of thousands of individuals across Pakistan and neighboring regions. By promoting sustainable livestock production, entrepreneurship, and renewable energy solutions, DSP has bridged the gap between

academic research and real-world impact. The platform has empowered faculty members, postgraduate scholars, smallholder farmers, and women entrepreneurs by translating scientific knowledge into practical business models that generate income, enhance food security, and promote animal welfare.

In Khyber Pakhtunkhwa and Northern Pakistan, DSP facilitated the development of climate-smart commercial models for quail, rabbit, poultry, and dairy farming. These models provided youth and small-scale producers with market-driven, income-generating opportunities through targeted training programs and startup incubation support. The University Feed Mill, operated as a semi-commercial venture, served as a demonstration unit for linking academic innovation with commercial livestock production.

To advance public health and biosafety, DSP partnered with Sandia National Laboratories (USA) to conduct Biorisk Management workshops. Over 100 professionals and students were trained in laboratory safety and biosecurity practices, with this curriculum later integrated into veterinary education programs across Pakistani universities—creating a long-lasting impact on public health preparedness.

DSP has also made a strong mark internationally. Through a biennial series of international conference and industrial exhibitions, memoranda of understanding, and cross-border collaborations in Turkey, Egypt, Afghanistan, and China, DSP established a platform for regional knowledge exchange. The Konya Conference and subsequent MoUs for Technoparks underscored its commitment to regional innovation ecosystems.

Moreover, DSP's emphasis on clean energy access led to the creation of GreenWend Energy Pvt Ltd and SunSaviour, two renewable energy startups that deliver affordable solar solutions to on-grid, off-grid, residential and industrial facilities. The International Solar Expo 2024, hosted under DSP's umbrella, further amplified these efforts by promoting decentralized, sustainable energy innovations.

Through this inclusive, participatory, and scalable approach, Dairy Science Park has strengthened local economies, empowered marginalized groups, and laid the foundation for a sustainable, climate-resilient livestock sector.

2. Direct Beneficiaries

Since its launch, Dairy Science Park (DSP) has directly benefited an estimated 20,000 individuals and entities through its integrated programs in livestock development, entrepreneurship, renewable energy, and eco-tourism. These beneficiaries represent a diverse cross-section of society—rural producers, youth, women, students, and community-based service providers—empowered through hands-on training, business support, and sustainable technologies. Breakdown of Direct Beneficiaries is as follows:

- Farmers and Livestock Producers (7,000+): Engaged in climate-smart farming, these beneficiaries have accessed improved animal health services, productivity-enhancing interventions, and veterinary support, resulting in better income and food security.
- Women and Youth Entrepreneurs (1,000+): Supported through entrepreneurship hubs, this group has gained access to training, microenterprise support, and market linkages in sustainable agriculture, livestock, and renewable energy sectors.

- Veterinarians and Paraveterinary Professionals (3,000): Trained in reproductive biotechnology, disease control, and sustainable animal health practices, these professionals serve as key service providers across the livestock value chain.
- Solar Energy Users (2,000 households): Beneficiaries of 15 MW of installed solar capacity through SunSaviour initiatives, enabling access to clean, affordable electricity and stimulating small business activity in rural areas.
- Students and Interns (2,000): DVM, MSc, and PhD students from the University of Agriculture Peshawar and partner institutions have participated in DSP-led training, research, and technopark-based field projects—translating learning into practice.
- Small-Scale Entrepreneurs (3,000): Engaged through DSP and SunSaviour, these individuals received support in input supply, product marketing, and value-added services, contributing to rural job creation and enterprise growth.
- Eco-Tourism Community Members (2,000): Local community members, including guides, artisans, homestay operators, and service providers, benefited from ecotourism programs under NESS-Pak in Khunjerab, Swat, and surrounding protected areas.

3. Climate Actions and Eco-Security

Dairy Science Park (DSP) has played a pivotal role in integrating climate resilience and eco-security into the livestock sector through resource-efficient practices, clean energy adoption, institutional reforms, and nature-based solutions. The actions may be reviewed as follows:

Sustainable Livestock Practices: Improved livestock production and processing models have minimized the risks of contaminating the food chain, water sources, and air, while simultaneously enhancing farm productivity and product quality. These practices include:

- Low-input farming models for quail, rabbit, and poultry.
- On-farm waste recycling into organic fertilizer.
- Reduced reliance on synthetic inputs and external feed resources.
- Climate-resilient livestock models, using locally adapted breeds resistant to drought and disease.
- Sustained rural incomes and resilience to climate variability through the replication of over 1,000 startup models in diverse agro-ecological zones.

These integrated solutions have not only conserved resources but also stimulated entrepreneurship and decent employment among rural communities.

Renewable Energy Integration: Clean energy adoption was institutionalized through the establishment of GreenWend Energy Pvt Ltd and SunSaviour, both dedicated to scaling solar-powered solutions for agriculture and rural livelihoods. Key achievements include: i) Promotion of decentralized solar energy systems in off-grid regions and ii) Organization of the International Solar Expo 2024, which significantly accelerated rural solar awareness and adoption across northern Pakistan.

Biorisk Management and Climate-Smart Research: DSP collaborated with academic partners to embed biorisk management and sustainable lab practices into university curricula. This initiative:i)

Promoted safe laboratory environments and climate-conscious research culture; ii) Engaged over 500 scholars in applied research linked to animal health, food safety, and environmental resilience.

Restoration of Nature and Eco-Security: DSP launched the National Eco-Security System of Pakistan (NESS-Pak) to institutionalize environmental conservation across academic and research institutions. Achievements include:

- Engagement of 347 institutions across Pakistan and abroad, with 82 (23.6%) providing institutional support, 66 (19.0%) offering individual pledges, and 199 (57.3%) pending engagement.
- A network of 526 registered supporters contributing to eco-security initiatives.
- Active conservation of protected areas, including Khunjerab National Park, which has been linked with the International Alliance of Protected Areas to support responsible ecotourism and reduce overgrazing.
- The Ministry of Science and Technology (MOST) is now considering the formal establishment of a National Eco-Security Commission of Pakistan, building on DSP's groundwork and policy advocacy.

4. Climate Impact

Over the past two years, SunSaviour and GreenWend Energy, under the Dairy Science Park umbrella, have successfully installed 15 megawatts (MW) of solar energy capacity, resulting in a reduction of approximately 24,638 metric tons of CO_2 emissions. This clean energy generation is equivalent to: i) 49 million kilowatt-hours (kWh) of renewable electricity; ii) Avoiding 24,638 tonnes of CO_2, and; iii) The carbon sequestration of 1.1 million trees.

In parallel, Dairy Science Park (DSP) has significantly contributed to climate change mitigation through a range of livestock-based and circular economy solutions, summarized below:

- Methane Emissions Reduction: Through targeted training of over 3,000 farmers and veterinary professionals, DSP improved livestock health and feeding practices. This led to an estimated 18–22% reduction in methane emissions per animal unit, amounting to: i) 1,500 tons of CO_2-equivalent avoided annually; ii) Totaling approximately 15,000 tons over 10 years;
- Resource Efficiency in Livestock Production: Pilot-scale Technoparks in Peshawar and Quetta demonstrated sustainable livestock production models that achieved: i) Up to 30% reduction in water use; 25% decrease in feed waste, and; iii) Significant reduction in antibiotic overuse, contributing to lower environmental contamination and antimicrobial resistance.
- Waste-to-Energy Innovation: DSP promoted on-farm biogas production using animal waste, with operational models generating up to 150 cubic meters/day of biogas. These systems: i) Replaced traditional firewood and fossil fuels in rural areas; ii) Resulted in an estimated 1,500 tons of CO_2 avoided annually; iii) Yielding a total reduction of 7,500 tons over five years.
- Climate-Resilient Livelihoods: By linking over 500 smallholder farms to market-driven value chains, DSP has helped rural communities establish climate-resilient enterprises, reducing dependence on climate-vulnerable practices, curbing urban migration, and alleviating pressure on natural resources.

Combined climate actions through DSP's renewable energy and sustainable livestock interventions have resulted in a total reduction of 47,138 metric tons of CO_2-equivalent emissions. This integrated approach reflects DSP's commitment to aligning food security, clean energy, and environmental stewardship as part of a sustainable climate strategy.

5. impact beyond climate action

Beyond climate action, our solution has improved lives across multiple domains; Health, Food, and Energy, by delivering sustainable, community-driven innovations as follows:

- Health: Through Dairy Science Park, we've improved animal health services by training over 3,000 veterinarians and para-vets, reducing disease transmission and zoonotic risks. Introduction of hygienic slaughterhouses and meat inspection systems led to a 30% reduction in foodborne illness reports in pilot districts.
- Food: Enhanced productivity of livestock (milk/meat) through climate-smart farming practices resulted in a 20–30% increase in household food availability among 500+ smallholder families. Better market access and food safety standards improved consumer trust and local food security, with over 10,000 consumers benefiting from clean, traceable animal products.
- Energy: The SunSaviour/GreenWend initiative installed 15 MW of solar energy, supplying over 49 million kWh of clean power—benefiting over 20,000 households. DSP also promoted biogas from livestock waste, powering farms and small businesses, replacing firewood and fossil fuels in off-grid communities.

Together, these efforts have led to healthier families, more secure food systems, and access to sustainable energy in previously underserved areas.

6. Quantifying the impact

The impact of Dairy Science Park beyond Climate, may be tabulated as follows:

Area	Impact Metric	Value
Health	Trained veterinarians and para-vets	3,000+ individuals
Food	Increase in livestock productivity (milk/meat)	20–30%
Food	Households with improved food availability	500+ families
Energy	CO_2 emissions avoided through DSP interventions	22,500 tons
Energy	CO_2 emissions avoided through SunSaviour installations	24,638 tons

7. Diversity, Inclusion, Equity

Our solution actively promotes diversity, inclusion, and equity across geographic, gender, and socioeconomic lines.

Through Dairy Science Park (DSP) and NESS-Pak, we have empowered marginalized livestock farmers, women entrepreneurs, and youth in underserved regions of Khyber Pakhtunkhwa and Northern Pakistan and Balochistan. Our programs have achieved the goals as follows:

- Gender Equality: Over 35% of beneficiaries in training and entrepreneurship programs are women. We have supported female-led livestock and dairy businesses, providing access to technical training, credit facilitation, and market linkages.
- Geographic Diversity: Our initiatives reach remote and conflict-affected regions, including tribal districts and the Northern Areas, ensuring that economic and environmental benefits extend beyond urban centers.
- Youth Empowerment: By engaging veterinary interns, young researchers, and graduates in hands-on training, innovation hubs, and business incubation under DSP and NESS-Pak, we have created decent employment opportunities for the next generation of rural leaders.
- Inclusive Governance: The Triple Helix Model (Academia–Industry–Government) we promote ensures stakeholder representation from all segments of society in planning and decision-making processes.
- Eco-Tourism and Indigenous Culture: Under NESS-Pak, we are integrating indigenous knowledge and cultural heritage into ecotourism development, especially in Khunjerab National Park, providing livelihoods to local communities and preserving traditional wisdom.

This inclusive approach has not only improved livelihoods but also strengthened community resilience, social cohesion, and environmental stewardship across socioeconomically disadvantaged populations.

8. Jobs created

A total of 2500 jobs were created, especially for the youth through motivation, trainings, advocacy as follows:

- Entrepreneurship Training & Grants through DSP platforms helped unemployed youth, especially women, launch livestock-based businesses and value-added ventures.
- DSP-UAP Internship Programs integrated students into real-world technopark environments, where many converted internships into startups or service units.
- SunSaviour's Green Jobs Model trained and hired youth for solar energy deployment, installation, and maintenance in rural and peri-urban regions.
- Community Mobilization by NESS-Pak in Khunjerab, Swat, and other protected areas supported the creation of nature-based jobs linked to eco-tourism, encouraging local ownership and sustainability.
- Agro-processing Units were supported under DSP guidance to generate both self-employment and wage-based jobs in rural micro-enterprises.

9. Way Ahead

Our solution operates through a multi-tiered delivery model integrating academia, industry, and government stakeholders under the Triple Helix Model. The program's key components are:

- Technoparks & Livestock Solutions: Establishment of climate-smart dairy and livestock technoparks (e.g., DSP, NESS-Pak initiatives) to promote sustainable farming practices, renewable energy solutions, and advanced animal health technologies.
- Training & Capacity Building: Providing hands-on training to farmers, veterinarians, women, and youth in sustainable livestock management, green energy, and biogas technologies.
- Eco-Security and Eco-Tourism: Engaging higher educational, research and government organizations in eco-security research and developing eco-tourism hubs in protected areas, integrating local communities into conservation and tourism activities while generating income.
- Renewable Energy Solutions: Installation of solar energy systems (via SunSaviour/GreenWend Energy) in underserved rural areas and promoting indigenous production of solar energy equipment, to provide clean energy and reduce reliance on fossil fuels.

Partnership and sponsorship are invited for implementation of this program, costing about US$ 35.00 millions.