

Breeding programs to accelerate dairy productivity in Nepal: Opportunity for adapting the Africa Dairy Genetic Gains (ADGG) program

Key messages

Adapting reproductive technologies for cattle and buffalo breed improvement programs in Nepal and can transform the country's dairy herd.

Current and emerging information and communication technology (ICT) and genomic tools as implemented by the Africa Dairy Genetic Gains (ADGG) program present new opportunities to hasten genetic gains in dairy productivity in Nepal.

The new national animal breeding policy in Nepal presents an opportunity for collaboration and accelerated change in dairy production systems.

A. Breed improvement programs in Nepal

A1. Dairy Cattle Improvement Program (DCIP)

Initially funded by the Food and Agriculture Organization (FAO) of the United Nations, the Dairy Cattle Improvement Program (DCIP) was implemented by the Ministry of Agriculture and Livestock development (MoALD) in Nepal through the National

Animal Breeding and Genetics Research Centre (NABGRC) and the Department of Livestock Services (DLS) in 14 districts (Dairy pocket areas, Figure 1) supporting the management of animals for better productivity.

While NABGRC supported the establishment of the pedigree and performance recording scheme (PPRS), the herd book, and development of the breed improvement strategy, DLS implemented various activities at the field level including artificial insemination (AI), animal health care and data recording. Both government and private sector practitioners (1952) provide AI using frozen semen and liquid nitrogen procured from DLS, and submit monthly reports on services to NLBO.

Figure 1. Map of Nepal showing 14 districts of the DCIP.



The DCIP has in recent years been scaled down and continued by the government through the PPRS (see section A3).

Focus of DCIP

- i) Improving the dairy cattle production environment (feeding health and management)
- ii) Improving dairy genetic potential through selection of the best cows within the population and upgrading using imported semen with the aim of upgrading the local population.
- iii) Providing feedback to farmers participating in the recording scheme on a monthly basis on:
 - Estimated Breeding Value (EBV) for milk quantity and milk solids
 - Somatic cell counts for monitoring mastitis

Salient features of the breeding program

Pedigree and performance recording scheme (PPRS) is in place

Data capture is paper-based

*Data is stored in a customized **MS-Access** database.*

*Genetic analyses implemented using **R**.*

*The production performance of **2,500 milking cows** (Holstein Friesian, Jersey and their crosses) produced using imported semen is monitored and evaluated.*

10,000 animals recorded from 850 herds in the 14 districts

Top 20% of cows are identified following evaluation are earmarked as potential bull dams.

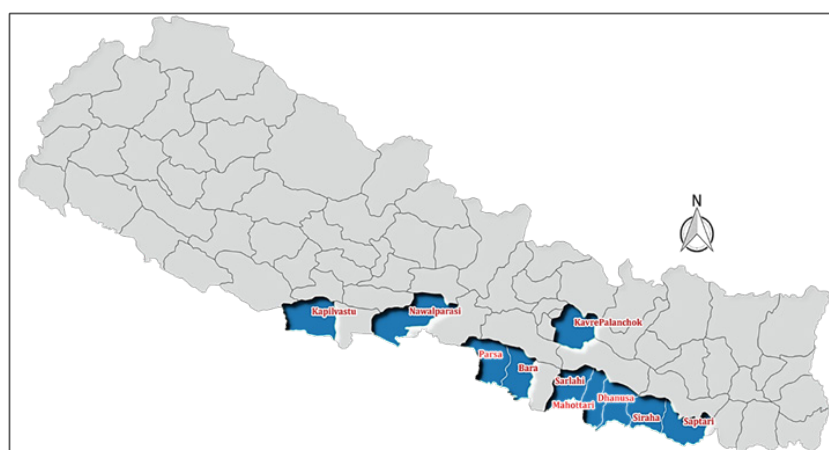
Top 5% bulls from evaluation are used for national semen production

A2. Buffalo Genetic Improvement Program (BGIP)

The Buffalo Genetic Improvement Program (BGIP) is funded by the government and follows a similar strategy to that adopted in the DCIP but on a smaller scale. So far 1,500 buffalo have been identified for monitoring productivity in 10 districts (Figure 2).

The identification system used for animals is provided through the DCIP, however, no national animal identification system is in place.

Figure 2. Map of Nepal showing districts for BGIP.



Focus of BGIP

- i) Germplasm importation of mainly Murrah buffalo from India
- ii) Address low conception rates when using AI
- iii) Address the challenge in accessing breeding bulls as maintaining a bull in the small holder systems is expensive
- iv) Address challenges with fertility and milk productivity in Buffalo's that are exhibited through long calving intervals and short lactation periods
- v) Provide options to adapt and utilize the dual purpose nature of buffalo products as both buffalo meat and milk are in high demand

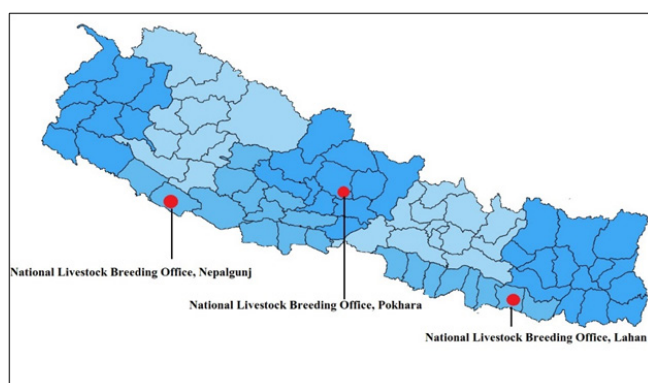
A3. Pedigree Performance Recording System (PPRS)

The PPRS program is implemented through the National Livestock Sector Innovation Project, which is funded by the World Bank. In the PPRS,

the National Livestock Breeding Office (NLBO) of the DLS is responsible for collecting and recording data, while NABGRC is the national authority to maintain the national livestock database, analyze the data and provide feedback to the farmers.

The current number of districts under recording has been reduced from 14 (DCIP) to six. NLBO works through three stations in the central, west and south regions of Nepal (Figure 3).

Figure 3. Map of Nepal showing location of NLBO centres.



Focus of NLBO

- i) Management of breeding sires (cattle, buffalo and goats)
- ii) Semen collection, processing, storage and distribution
- iii) Liquid nitrogen production, procurement and distribution
- iv) Monitoring the AI program

Policy framework

A new animal breeding policy was drafted and passed which has stipulated requirements for breeding support services. No laws are currently in place to support implementation of the policies.

B. The ADGG program

Led by the International Livestock Research Institute (ILRI) the ADGG program (<https://portal.adgg.ilri.org/>) addresses livestock productivity challenges to improve dairy production in Africa. This is by bridging the gap in information on system characteristics, productive performance and genomic information on dairy animals from farming systems of Africa.

The overall goal of ADGG is to establish working dairy genetics systems based on public-private

partnerships with a clear route to long-term sustainability that will ensure smallholder dairy farmers are continuously accessing more productive dairy genetics, breeding, farmer education services, and other related input services to enable their farming enterprises to be profitable and competitive

Focus of ADGG

- Establish/revamp national livestock performance recording systems to sustainably support long term improved productivity across all farming systems.
- Develop, domesticate and scale information and communication technology (ICT) tools to capture herd, cow level and other related data from small, medium and large scale farms, and integrate these into national herd performance recording and evaluation systems.
- Develop a pipeline for genomic evaluations and indices to identify genetically superior bulls and cows and promote use of the bulls through Artificial Insemination and natural mating.
- Establish digital farmer extension and feedback systems using herd performance, genomic data and data from relevant input service providers in order to improve herd management and profitability.
- Establish private-public partnerships for long-term sustainability of genetic gains at both county and regional levels.

C. Opportunities for collaboration between ADGG and Nepal

There is opportunity for collaboration between ADGG and the various MoALD departments and institutions in Nepal through:

1. Using ICT and genomic tools to address, in transformative and scalable ways, the current challenges and limitations in collecting herd performance data, analyzing and providing timely feedback to farmers and various actors within the country
 - Expanding use of animals under the PPRS for large-scale genomic evaluation of the populations and improved selection of breeding bulls and bull dams from within the national population.
2. Supporting development and adoption of more sustainable infrastructure to support provision of breeding, input and market support services including improved 'seed-animals' (both male and female) to catalyze productivity gains and improved dairy value chain efficiency.
3. Developing capacity of partners in Nepal to implement genomic evaluation of dairy animals and other livestock species through relevant training, access to software and data.

D. General recommendations

- Sufficient variations exist within smallholder livestock populations to allow for significant genetic gains, as long as such data can be captured and used to inform appropriate technology, policy and business decisions.
- The national livestock identification and recording is key and feasible in Nepal.
- Genetic improvement is long-term and should be a continuous activity and ideally not carried out by time-bound projects.
- Inter-institutional and country collaboration and joint evaluations can add value to genetic improvement efforts.
- Public investments and private partnerships are needed (farmers are the critical partners) for sustainability.
- Current and emerging ICT and genomic tools and reproductive technologies present new opportunities for Low and middle income countries to hasten genetic gains

Potential partners in Nepal

The National Animal Breeding and Genetics Research Centre (NABGRC) and the National Livestock Breeding Office (NLBO).

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Authors

Julie M.K. Ojango. and Ally M. Okeyo work for the International Livestock Research Institute (ILRI), Kenya. Padmakumar, V works for ILRI, Nepal.

Contact


Padmakumar, V
ILRI, Nepal
V.Padmakumar@cgiar.org

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