### Project Title:
Determining performance of different dairy goat breeds under different production systems and agro-ecological zones

### Annual Report
**Period Covered:** Jan, 2020 – Sep, 2021

### KCSAP livestock Applied
**Value chain:** Dairy  **Duration:** 18 Months  **Start Date:** Jan, 2020

### Lead Institution:
Dairy Research Institute, Kenya Agricultural and Livestock Research Organization (KALRO)

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### Background
Dairy goats form an integral component of the livestock sector in Kenya which contributes to food security and increased household incomes. Their production is one of the climate-smart agricultural systems that could build farmers resilience to climate change. Goats are more adaptable than other livestock species as they thrive in a variety of agro-ecological zones and management systems.

Dairy goat germplasm availability has been highlighted as a major constraint to dairy goat production in Kenya. Different exotic dairy goat breeds have been used for continuous crossbreeding system to produce dairy goat breeds with different proportions of genes. Due to demand of dairy goats, some farmers have resorted to directly sourcing their breeding stock from other farmers in different locations of the country, notwithstanding their undefined genetic constitution.

The unique gene combination of the breed types has equipped them with attributes that allow them to exhibit different performance levels in diverse production systems and environments. However, most of the breed-types are a result of un-systematic crossbreeding programmes. Such unplanned crossbreeding strategies make it difficult to ascribe certain gene proportions and combinations to given performance levels within a given production environment or agro-ecological zone. The increase in demand for dairy goats in the country has resulted in several farms setting up nucleus flocks with significant proportion of the crossbred flocks as a source of breeding material for distribution to lower cadre farmers.

There has been no deliberate effort to understand the genetic composition and relationships among the dairy goat breed-type(s) populations in the country and to further determine the extent of gene introgression from the exotic purebreds using genomic tools. Genetic characterization of existing dairy goat genotypes in the country will ascertain the genetic diversity and establish the population
structure. The farmers will have evidence to support decision making with the knowledge of productivity and profitability of the dairy goat genotypes. This will form the basis for recommending certain breeding program organization for different dairy goat genotypes and also a starting point to better address future breeding and management policies in dairy goat.

**Objectives**

1. To determine dairy goat genetic diversity and population structure for design of mating systems management strategies to increase milk productivity.
2. To evaluate performance of various dairy goat breeds for suitability in different production systems and agro-ecological zones.

**Expected Outputs**

1. Dairy goat genetic diversity and population structure for the selected breeds (Alpine, Saanen and Toggenburg) will be determined for utilization and conservation for enhanced milk production.
2. The most appropriate dairy goat breed genotypes for different production system and agro ecological zones will be determined.

**ANNUAL REPORT**

**I ACHIEVEMENTS**

Objective 1: To determine dairy goat genetic diversity and population structure for design of mating systems management strategies to increase milk productivity

Activity 1.1 Collection of blood samples from the various breeds for DNA isolation: To collect blood samples from the various goat breeds reared on centre and one of the multipliers.

Achievement 1.1: (Briefly give the achievements against what was planned)

A total of 289 blood samples were collected from goat breeds on station as shown in Table 1.

<table>
<thead>
<tr>
<th>Breed</th>
<th>No of Samples collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saanen</td>
<td>30</td>
</tr>
<tr>
<td>Toggenburg</td>
<td>44</td>
</tr>
<tr>
<td>German Alpine</td>
<td>19</td>
</tr>
<tr>
<td>British Alpine</td>
<td>4</td>
</tr>
<tr>
<td>Kenya Dual Purpose Goat (KDPG) upgrades</td>
<td>59</td>
</tr>
<tr>
<td>27 farm (Mixed) (Multiplier)</td>
<td>40</td>
</tr>
<tr>
<td>KDPG</td>
<td>40</td>
</tr>
<tr>
<td>Crosses</td>
<td>45</td>
</tr>
<tr>
<td>All</td>
<td>289</td>
</tr>
</tbody>
</table>

Activity 1.2: DNA extraction at KALRO-NARL, Kabete and genotyping: To extraction, quantify and dry genomic DNA samples at KALRO-NARL Kabete and send them for genotyping.

Achievement 1.2: 288 genomic DNA samples were extracted, quantified and dried and shipped to Neogen Company for genotyping.
**Activity 1.3:** Genomic data analysis to determine the genetic diversity, population structure and generate breeding values: To analysis the sequenced data to determine the genetic diversity, population structure and generate breeding values.

**Achievement 1.3:** Cleaning of the sequenced genomic data commenced

**Objective 2:** To evaluate performance of various dairy goat breeds for suitability in different production systems and agro-ecological zones

**Activity 2.1:** Dairy goat recording and maintenance of the flock data on-station: To collect the performance data (birth weight, weekly weight, weaning weight, milk production, mortality, type of birth etc.) for the various dairy goat breeds managed on-centre.

**Achievement 2.1:** About 300 dairy goats of different breeds (three), sex and status were maintained on the center. Basic phenotypic records were continuously collected from each of the animals in the programme. This includes weight records, milk records, kidding records, service records, mortality records and other incidences in the farm.

**Activity 2.2:** Monitoring and evaluation of data collection: To monitor and evaluate the data collection process on centre.

**Achievement 2.2:** Three dairy goat breeds pedigree and performance records were recorded and maintained.

**Activity 2.3:** Data analysis: To analyze data collected in order to inform on dairy goat performance

**Achievement 2.2:** Cleaning of collected data initiated

**II Other achievements:** Not yet

**III Constraints and how they were overcome**

**Constraints**
- Structured data collection was not practiced before the project so it took time for the attendant to acclimatize with the process
- Dairy goats were few so data was not enough for analysis

**How the constraints were overcome**
- Training the attendants on data recording and the importance of data collection
- Data analysis delayed
IV Summary of funds received, accounted for and balance

<table>
<thead>
<tr>
<th>Project (KES)</th>
<th>Amount Received (KES)</th>
<th>Amount accounted for (KES)</th>
<th>Balance (KES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,812,660</td>
<td>1,960,240</td>
<td>All</td>
<td>1,852,420</td>
</tr>
</tbody>
</table>

IV Way Forward
Activities Planned for the Period Oct 2021-June 2022

<table>
<thead>
<tr>
<th>Activity</th>
<th>Targets in Y1 Q2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genomic data analysis to determine the gene diversity, population structure and generate breeding values.</td>
<td>• Genomic data analysed and manuscript developed</td>
</tr>
<tr>
<td>Maintenance of the flock</td>
<td>• At least 300 dairy goats maintained on-station at Naivasha</td>
</tr>
<tr>
<td>Data analysis</td>
<td>• At least 1 manuscript developed</td>
</tr>
<tr>
<td>Dairy goat recording and on economic and production data on farm</td>
<td>• Production data for at least 3 breeds recorded and maintained</td>
</tr>
<tr>
<td>Monitoring and evaluation of data</td>
<td>• Data for at least 3 breeds monitored and evaluated</td>
</tr>
</tbody>
</table>