CLIMATE-SMART DAIRY TRAINING OF TRAINERS (ToT)- A REPORT

Strengthening Capacity for Low-Emission, Productive, and Sustainable Smallholder Dairy Farming in Kenya



Client / Funder: Solidaridad East and Central Africa

Implementing Partner: Alliance of Bioversity International and CIAT (Alliance Bioversity–CIAT) – Tropical Forages Program

Lead Trainers / Facilitators: Dr. Solomon Mwendia, David Muruu, & Peggy Karimi

Target Group: Extension officers, agricultural officers, dairy cooperative trainers, field officers, lead trainers, and other personnel responsible for cascading training to farmers in Nyandarua and Nakuru Counties

Training Locations: Nyandarua County, Nakuru County, and DRI–KALRO Naivasha

Reporting Period: June 30 – August 21, 2026

Country: Kenya

1. Executive Summary

Smallholder dairy production in Kenya faces the dual challenge of meeting growing demand for milk while improving environmental sustainability and reducing greenhouse gas (GHG) emissions, particularly enteric methane emissions.

To address these challenges, Solidaridad East and Central Africa, in partnership with the Alliance of Bioversity International and CIAT (Alliance Bioversity–CIAT) through its Tropical Forages Program, implemented a series of Climate-Smart Dairy Training of Trainers (ToT) programmes in Nyandarua and Nakuru Counties in Kenya.

The training programme was designed to equip extension officers, trainers, lead farmers, cooperative trainers, and other dairy-sector personnel with practical knowledge and facilitation skills that they can subsequently transfer to smallholder dairy farmers.

The programme was implemented through three Training of Trainers (ToT) cohorts, each conducted at a designated training venue. The cohorts were organized to bring together participants from the respective target areas and to strengthen their capacity to subsequently train and support smallholder dairy farmers.

1. **Nyandarua Cohort:** The Nyandarua County cohort comprised participants drawn from Weru, Charagita, Gathara, & Engineer wards and was trained at Ol Joro Orok Agricultural Training Centre (ATC) from June 30 to July 3, 2026.
2. **Nakuru Cohort:** The Nakuru County cohort comprised participants drawn from Bahati and Njoro wards and was trained at Tumaini Conference Centre from July 7 to July 10, 2026.
3. **Combined Nyandarua–Nakuru Cohort:** A third cohort comprising participants drawn from both Nyandarua (Gathara and Engineer) and Nakuru (Bahati and Njoro) counties was trained at the Dairy Research Institute (DRI), KALRO Naivasha, from August 19 to August 21, 2026.

Across all three cohorts, the participants were selected and trained as farmer trainers and extension resource persons, with the primary objective of enabling them to cascade climate-smart dairy knowledge, skills, and practices to smallholder dairy farmers within their respective areas of operation.

The curriculum was based on a training manual titled developed by Tropical Forages Program for Solidaridad '*Climate-Smart Dairy Farming: A Practical Guide to Sustainable Productivity*' (https://docs.google.com/document/d/1i0S6A4LFjYddbO3YCbYtDrYtuuWo-6lO/edit) and combined adult learning and facilitation techniques with practical technical modules on low-methane dairy production, feed formulation, forage agronomy, forage conservation, lactation management, animal husbandry, housing, milking hygiene, herd health, and manure management.

All training sessions included practical field sessions covering zero-grazing systems, feeding and trough management, milking hygiene, housing, forage identification, and forage conservation (https://hdl.handle.net/10568/185068).

Pre- and post-training assessments were used to measure changes in participant knowledge. For the three assessed cohorts, a total of 113 participants were included:

- **Nyandarua:** 56 participants.
- **Nakuru:** 38 participants.

- **Combined Nyandarua–Nakuru cohort:** 19 participants.

Across the three cohorts, the weighted overall average assessment score increased from 59.38% before training to 71.08% after training, representing an improvement of 11.70 percentage points.

The results provide evidence of increased measured knowledge among participants following the training. More importantly, the ToT model establishes a mechanism for cascading the knowledge to a much larger population of smallholder dairy farmers through farmer trainings, demonstrations, field days, and extension support.

2. Project Background

Dairy farming is an important source of food, income, employment, and livelihoods for smallholder households in Kenya and across East Africa. However, dairy production is also associated with environmental challenges, including methane emissions from enteric fermentation.

Improving the efficiency of dairy production can contribute to reducing emissions intensity while improving farm productivity and profitability. Key opportunities include improving feed quality and digestibility, increasing animal productivity, strengthening forage production and conservation, optimizing diets, improving herd health, and adopting appropriate housing and manure management practices.

Climate-smart dairy production therefore requires an integrated approach that combines:

- Improved nutrition and feed efficiency.
- High-quality forage production.
- Appropriate supplementation and ration formulation.
- Improved animal productivity.
- Better herd health and reproduction.
- Improved housing and animal welfare.
- Hygienic milk production.
- Appropriate manure management.
- Effective farmer knowledge transfer and extension support.

The training programme was designed to strengthen the capacity of individuals who are responsible for transferring these practices to farmers. The programme was commissioned by Solidaridad and implemented by the Alliance of Bioversity International and CIAT, drawing on the technical expertise of its Tropical Forages Program.

3. Training Objectives

The overall objective of the programme was to strengthen the capacity of trainers and extension personnel to promote climate-smart dairy practices among smallholder farmers.

Specific Objectives

The training sought to:

1. Equip ToTs with adult learning and facilitation skills to support effective farmer-level knowledge transfer.
2. Strengthen understanding of climate-smart and low-methane dairy production, including feed efficiency and animal productivity.
3. Build technical capacity in forage management, including species selection, establishment, harvesting, utilization, and conservation.
4. Strengthen knowledge of feed formulation and ration management, including the use of tools, such as *Rumen8*.
5. Improve understanding of lactation management and changing nutritional requirements throughout the production cycle.
6. Promote improved animal husbandry and housing, including zero-grazing unit management.
7. Strengthen knowledge of milking hygiene and herd health management.
8. Promote appropriate manure management practices.
9. Prepare participants to cascade the training to smallholder dairy farmers through step-down trainings, field days, demonstrations, and extension activities.

4. Training Locations, Dates, and Participants

The training was implemented across three locations/cohorts.

Training Location / Cohort	Venue	Dates	Number of Participants	Target Participants
Nyandarua County	Ol Joro Orok Agricultural Training Centre (ATC)	June 30 – July 3, 2026	56	Trainers, extension personnel and other dairy-sector personnel responsible for farmer training
Nakuru County	Tumaini Conference Centre	July 7 – July 10, 2026	38	
Combined Nyandarua–Nakuru Cohort	Dairy Research Institute (DRI), KALRO Naivasha	August 19 – August 21, 2026	19	

NB: The respective participant lists are attached overleaf.



Participants attending the Nyandarua Cohort Training at Ol Joro Orok Agricultural Training Centre, Nyahururu



Participants attending the Nakuru Cohort Training at Tumaini Conference Centre, Nakuru



Participants attending the combined Nyandarua-Nakuru Cohort Training at DRI, Naivasha

5. Training Approach and Methodology

The programme used a Training of Trainers (ToT) approach. Participants were not trained solely as end-users of the information; they were prepared to become trainers and facilitators capable of transferring the knowledge and skills to farmers. The training methodology combined:

- Classroom presentations.
- Participatory adult-learning techniques.
- Group discussions.
- Pair-and-share exercises.
- Experience sharing and demonstrations.

- Field visits.
- Live forage identification.
- Farm-system observation.
- Housing assessment.



Participants attending the Nyandarua Cohort Training following a presentation done by Dr. Solomon Mwendia on the lactation cycle.



Participants attending the Nakuru Cohort Training following a presentation done by David Muruu on Clean milking.



Participants attending the Nakuru Cohort Training sharing experiences on accurate heat detection in dairy cows.



A participant doing a recap of the previous day's learnings during the Nakuru cohort training.



Participants discussing their understanding of various climate smart practices during the Nakuru cohort training.



Participants conducting a housing, feeding, and watering troughs inspection at the Tumaini Conference Centre's livestock unit.

The approach was designed to move beyond lecture-based training and provide participants with practical skills that could be reproduced during farmer-level trainings.

6. Training Curriculum

The programme followed a structured five-lesson curriculum.

Lesson	Topic	Key Focus
Lesson 1	Principles of Facilitation and Adult Learning	Participatory methods and effective farmer facilitation
Lesson 2	Low-Methane Mitigation Strategies	Feed efficiency, productivity, and genetics

Lesson 3	Feed Formulation, Lactation Curves, and Feed Rationing	Nutritional requirements for for lactating cows and the lactation cycle
Lesson 4	Forage Agronomy and Conservation	Forage options, and their establishment, harvesting, and conservation
Lesson 5	Animal Husbandry, Housing, Hygiene and Manure Management	Housing, herd health, hygiene, and manure management

7. Training Assessment Results

Pre- and post-training assessments were conducted to measure changes in participants' knowledge following the training. Each assessment consisted of 21 questions, making 21 the maximum possible score. Three cohorts were assessed:

- Nyandarua cohort – 56 participants.
- Nakuru cohort – 38 participants.
- Combined Nyandarua–Nakuru cohort – 19 participants.

This resulted in a total of 113 assessed participants.

7.1 Cohort-Level Results & their Interpretation

Cohort	Number of Participants	Average Pre-training Score	Average pre-training %	Average Post-training Score	Average post-training %	Improvement
Nyandarua	56	12.09 / 21	**57.57%**	13.96 / 21	**66.48%**	**+8.91 pp**
Nakuru	38	12.66 / 21	**60.29%**	15.34 / 21	**73.05%**	**+12.76 pp**
Combined Nyandarua–Nakuru	19	13.21 / 21	**62.90%**	16.95 / 21	**80.71%**	**+17.81 pp**
Overall	**113**	**12.47 / 21**	**59.38%**	**14.93 / 21**	**71.08%**	**+11.70 pp**

***pp** = percentage points. Percentages are calculated against the maximum score of 21. The overall result is weighted according to the number of participants in each cohort.*

The assessment results show an increase in average knowledge scores across all three cohorts.

Nyandarua Cohort: The 56 participants in the Nyandarua cohort recorded an average pre-training score of **12.09 out of 21**, equivalent to **57.57%**. The post-training average increased to **13.96 out of 21**, equivalent to **66.48%**. This represents an improvement of **8.91 percentage points**.

Nakuru Cohort: The 38 participants in the Nakuru cohort recorded an average pre-training score of **12.66 out of 21**, equivalent to **60.29%**. The post-training average increased to **15.34 out of 21**, equivalent to **73.05%**. This represents an improvement of **12.76 percentage points**.

Combined Nyandarua–Nakuru Cohort: The combined cohort of 19 participants recorded an average pre-training score of **13.21 out of 21**, equivalent to **62.90%**. The post-training average

increased to **16.95 out of 21**, equivalent to **80.71%**. This represents an improvement of **17.81 percentage points**.

Overall Results: When the three cohorts are weighted according to their respective participant numbers, the overall average score increased from approximately **12.47 out of 21 (59.38%)** before training to **14.93 out of 21 (71.08%)** after training. This represents an overall improvement of **11.70 percentage points**.

The assessment results therefore indicate an increase in participants' measured knowledge following the ToT programme. The results should be interpreted as evidence of change in assessed knowledge rather than as a direct measurement of farmer adoption, productivity, or reductions in methane emissions.

8. Farmer Training and Extension Cascade

A central feature of the programme was the development of a training cascade designed to extend the reach and sustainability of the programme beyond the initial Training of Trainers (ToT) participants. Selected participants were trained with the expectation that they would subsequently train and support smallholder dairy farmers within their respective areas.

Planned Activities

8.1 Step-Down Farmer Trainings

Trained ToTs will organize farmer group trainings, field days, demonstrations, and other extension activities targeting smallholder dairy farmers. These activities will facilitate the transfer of knowledge and skills from ToTs to farmers at the local level.

8.2 Demonstration Plots and Practical Learning Sites

ToTs and extension partners will support selected farmers in establishing demonstration plots featuring appropriate forage species, including:

- *Brachiaria*.
- *Desmodium*.
- Fodder shrubs and trees.
- Other locally appropriate forage species.

The demonstration plots will serve as practical learning sites where farmers can observe and apply improved forage production and management practices.

8.3 Practical Farmer-Level Demonstrations

Farmer-level training will emphasize hands-on application of improved dairy management practices, including:

- Improved feeding.
- Ration formulation.

- Forage establishment.
- Forage harvesting.
- Hay and silage conservation.
- Housing improvement.
- Milking hygiene.
- Herd health.
- Manure management.

Through this cascade approach, the programme will expand access to practical knowledge and technologies, strengthen local extension capacity, and support wider adoption of improved dairy production practices among smallholder farmers.

9. Monitoring, Evaluation and Follow-Up

Following completion of the ToT programme, continued monitoring will be important to determine whether the knowledge acquired is being transferred to farmers and translated into changes in practice. Monitoring should track:

1. Number of ToTs conducting farmer trainings.
2. Number of farmers reached through the training cascade.
3. Number of farmer field days and demonstrations conducted.
4. Establishment of improved forage plots.
5. Adoption of improved feeding and rationing practices.
6. Adoption of forage conservation practices.
7. Improvements in housing and animal management.
8. Adoption of improved milking hygiene.
9. Follow-up technical support provided to farmers.
10. Where feasible, changes in milk productivity and other farm-level indicators.

The pre- and post-training assessment provides a baseline for measuring immediate knowledge change among ToTs. Future monitoring can complement this with indicators of knowledge transfer, farmer adoption, productivity, and environmental outcomes.

10. Key Outputs

The programme achieved the following key outputs:

- Conducted Climate-Smart Dairy ToT activities across targeted training locations.
- Strengthened the capacity of extension personnel and other farmer trainers.
- Delivered a structured five-lesson curriculum covering climate-smart dairy production and adult learning.
- Combined classroom-based learning with practical field demonstrations.
- Exposed participants to improved feeding, housing, milking hygiene, forage management, and conservation practices.
- Conducted pre- and post-training assessments.
- Assessed **113 participants** across the three reported cohorts.
- Recorded an overall increase in average assessment scores from **59.38% to 71.08%**.

- Developed a pool of trained personnel capable of cascading climate-smart dairy knowledge to smallholder farmers.
- Initiated the basis for continued farmer-level demonstrations and extension support.

11. Conclusion

The Climate-Smart Dairy Training programme strengthened the technical and facilitation capacity of personnel responsible for supporting smallholder dairy farmers in Kenya. Through the collaboration between Solidaridad and the Alliance of Bioversity International and CIAT, participants were exposed to an integrated package of climate-smart dairy practices covering nutrition, feed efficiency, forage management, animal husbandry, housing, herd health, milking hygiene, and manure management.

The Training of Trainers approach ensured that the programme was designed to build the capacity of participating individuals and establish a mechanism for cascading knowledge and practical skills to a wider population of smallholder dairy farmers.

The assessment results demonstrate an increase in measured knowledge across all assessed cohorts. Across 113 participants, the weighted average score increased from 59.38% before training to 71.08% after training, representing an 11.70-percentage-point improvement.

The next stage of implementation should focus on translating this increased trainer capacity into farmer-level action through step-down trainings, demonstration plots, field days, extension support, and systematic monitoring of adoption.

Ultimately, the effectiveness of the programme will be demonstrated by improved trainer knowledge and the extent to which trained personnel successfully transfer these practices to farmers and support their sustained adoption at farm level.

Acknowledgement

We thank Solidaridad East and Central Africa for giving opportunity and financial support to Tropical Forages Program of the Alliance of Bioversity International & CIAT to undertake capacity sharing with livestock trainers in Nakuru and Nyandarua counties in Kenya. This work complements efforts by CGIAR Sustainable Animal & Aquatic Foods Science Program in Kenya dairy value chain.