

# Supporting livestock feed and health activities for the Rwanda Dairy Development Project – final report



ILRI PROJECT REPORT

# Supporting livestock feed and health activities for the Rwanda Dairy Development Project – final report

Alan Duncan<sup>1</sup>, Ben Lukuyu<sup>2</sup>, Melkamu Derseh<sup>1</sup>, Emily Ouma<sup>2</sup>, V. Padmakumar<sup>3</sup>, Gilbert Mutoni<sup>4</sup>, Sita Ghimire<sup>5</sup>, Eunice Machuka<sup>5</sup>, Remy Titien Niyireba<sup>6</sup>, Marie Christine Dusingize<sup>7</sup>, Marie Anne Mukasafari<sup>7</sup> and Mupenzi Mutimura<sup>6</sup>

1. International Livestock Research Institute, Ethiopia
2. International Livestock Research Institute, Uganda
3. International Livestock Research Institute, Nepal
4. International Livestock Research Institute, consultant
5. International Livestock Research Institute, Kenya
6. Rwanda Agriculture and Animal Resources Development Board
7. University of Rwanda

May 2022




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ILRI thanks all donors and organizations which globally support its work through their contributions to the [CGIAR Trust Fund](#)



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Editing, design and layout—ILRI Editorial and Publishing Services, Addis Ababa, Ethiopia.

Cover photos—CIAT/Stephanie Malyon

ISBN: 92-9146-724-3

Citation: Duncan, A., Lukuyu, B., Derseh, M., Ouma, E., Padmakumar, V., Mutoni, G., Ghimire, S., Machuka, E., Niyireba, R.T., Dusingize, M.C., Mukasafari, M.A. and Mutimura, M. 2022. *Supporting livestock feed and health activities for the Rwanda Dairy Development Project – final report*. ILRI Project Report. Nairobi, Kenya: ILRI.

*Patron: Professor Peter C Doherty AC, FAA, FRS*

*Animal scientist, Nobel Prize Laureate for Physiology or Medicine—1996*

Box 30709, Nairobi 00100 Kenya

Phone +254 20 422 3000

Fax +254 20 422 3001

Email [ilri-kenya@cgiar.org](mailto:ilri-kenya@cgiar.org)

[ilri.org](http://ilri.org)

*better lives through livestock*

ILRI is a CGIAR research centre

Box 5689, Addis Ababa, Ethiopia

Phone +251 11 617 2000

Fax +251 11 667 6923

Email [ilri-ethiopia@cgiar.org](mailto:ilri-ethiopia@cgiar.org)

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## Summary

The International Livestock Research Institute (ILRI) has been supplying technical support on livestock feeding and health to the Rwanda Dairy Development Project (RDDP) since late 2018. Support has been driven by RDDP needs and has included diagnosis of livestock feed constraints using the FEAST methodology; development of feed intervention plans in consultation with local stakeholders; monitoring of livestock feed interventions including assessment of farmer perceptions; training on assessment of the costs and benefits of feed interventions; analysis of costs and benefits of feed interventions; training on use of ration balancing software (On-farm Feed Advisor–OFA); development of a bespoke version of OFA for Rwanda conditions; development of a technical manual on feeding the dairy cow; and evaluation of laboratory procedures for assessment of milk quality. Activities have been conducted using a blend of virtual and face-to-face engagement against the backdrop of the COVID-19 pandemic.

## Background

The Rwanda Dairy Development Project (RDDP) is an ongoing project that was launched in 2016 to contribute to pro-poor economic growth and enhance the livelihood of poor rural households through dairy farming. The project seeks to promote climate-smart dairy farming practices and empower women and youth by integrating them into the dairy value chain. The project is funded by a concessional loan and grant from the International Fund for Agricultural Development (IFAD), private sector/banks, Heifer International, and the Rwandan government through tax exemptions. The Rwanda Agriculture and Animal Resources Board (RAB) is the lead implementing agency in partnership with Heifer International, the Rwanda Cooperative Agency, the Rwanda National Dairy Platform (RNDP), the Business Development Foundation, and the Rwanda Council of Veterinary Doctors.

The RDDP has built on the past achievements in the dairy sector and it has focused on increasing cattle productivity, milk quality, and processing capacity of the dairy industry and strengthening the policy and institutional framework for the sector. To achieve the goal of doubling milk production from 2010 to 2020, RDDP has initiated different feed resource development interventions being implemented through Livestock Farmer Field Schools (L-FFS) and forage seed multipliers.

The International Livestock Research Institute (ILRI) has been providing technical support to the RDDP since early 2019, mainly on feed-related interventions, including follow up support on feed intervention strategies being implemented through the L-FFS approach as well as monitoring of feed interventions. Further technical support has been offered on animal health and laboratory analyses.

The main areas of support have been the following:

- Diagnosis of feed constraints using the Feed Assessment Tool (FEAST)
- Development of feed intervention plans based on FEAST results
- Monitoring of feed interventions and provision of technical support on feed interventions
- Analysis of the costs and benefits of implemented feed interventions
- Introduction and training on the use of the On-Farm Feed Advisor application including customizing the app for Rwandan conditions
- Development of a technical manual on dairy cow feeding contextualized to the Rwandan context
- Support for improving laboratory analysis on milk testing and quality control

# Activities planned and undertaken

## Livestock feed

### I. FEAST: Training local staff in use of FEAST, rolling out FEAST in six focal sites and developing FEAST reports

#### FEAST training

A FEAST training was held in Kigali, Rwanda, 21-25 January 2019 to train master trainers on using the FEAST tool. A total of 19 master trainers participated in the training. The participants were drawn from RAB, University of Rwanda (UR), and from the Single Project Implementation Unit (SPIU) of the IFAD/RDDP. They included mainly government officers with livestock knowledge who would then facilitate the implementation of FEAST and subsequent feed interventions in selected RDDP project areas in Rwanda. The course followed a classroom instruction format with a field exercise. The course included 12 lessons, five interactive scenarios related to key skills, and over 200 review and assessment questions.

The training followed a typical five-day classroom format. However, participants were exposed to an E-learning course, and also the FEAST website: <https://www.ilri.org/feast> to familiarize themselves with the FEAST tool methodology in advance. The first day of the course introduced the participants to the first three lessons— the FEAST concept, preparing for a farmer- diagnosis, and focus group discussions (FGDs). The second day focused on collecting data from focus groups, individual farmer Interviews, making follow-up visits and summarizing data. The third day was entirely taken up by the field exercise where participants conducted a focus group and one-on-one interviews with local farmers near the training site. The fourth day was devoted to familiarization with FEAST data application, entering data and viewing outputs. The fifth and final day was committed to training on preparing the Financial Controller's Division (FCD) report and implementing livestock feed interventions.

The field testing of the FEAST tools was conducted at Eastlands Hotel in Kayonza District on 23 January 2019. The organizers brought together two groups of farmers. One group consisted of 12 farmers from Kayonza District, a relatively intensive crop-livestock system area, while the other groups of 12 farmers was from Rwamagana District, a semi-extensive agro-pastoral system area. A total of 24 farmers were involved in testing of the FEAST tools with trainers. The participants conducted two separate FGDs with groups from each of the selected areas and thereafter each participant had a chance to conduct an individual interview with a farmer.

The training concluded with an action plan to implement FEAST in six RDDP field sites.

#### Implementation of FEAST

One of the objectives of ILRI's technical support to Rwanda was to explore mechanisms for rolling out the Feed Assessment Tool (FEAST) in RDDP interventions areas to provide information that can be used to design intervention strategies. As a result, in close collaboration with local scientists and livestock experts at SPIU/RDDP, we selected



target sites (6) for FEAST implementation, prepared an activity workplan to enable participants to collect data using the FEAST components - individual farmer questionnaire and FEAST focus group discussion guide; and technical FEAST teams of three master trainers (MTs) comprising a facilitator, note taker and timekeeper. This allowed formation of five groups. Each group was assigned to conduct one FEAST per site and one group conducted one FEAST in each of two sites (Table 1). The teams jointly undertook analyses of the collected data on local feed resource availability and use and produced a FEAST report as well a data set in Excel and Zlib formats for each site.

**Table 1: Sites for implementation of FEAST, 11-15 February 2019**

Groups of MTs	District	Sector	Cell
1	Nyagatare	Rwimiyaga	Gacundezi
2	Gicumbi	Rutare	Gatwaro
3	Musanze	Kinigi	Nyonirima
4	Rubavu	Mudende	Kanyundo
5	Nyanza	Kibirizi	Rwotso
6	Rutsiro	Boneza	Remera

## Development of FEAST reports

Following implementation of FEAST, participants developed FEAST reports which were then edited and improved by ILRI staff to bring them to publication standard. The FEAST reports were then published on CGSpace. The reports presented an overview of the livestock feeding system in each site and provided some preliminary ideas for feed interventions based on the information collected from farmers. The FEAST reports can be accessed using these links:

<https://hdl.handle.net/10568/111263>

<https://hdl.handle.net/10568/111262>

<https://hdl.handle.net/10568/111146>

<https://hdl.handle.net/10568/110584>

<https://hdl.handle.net/10568/110583>

<https://hdl.handle.net/10568/111364>

## 2. Finalize feed interventions: Using virtual workshops, guiding and providing technical assistance for prioritization of feed interventions across six sites.

A workshop was convened to identify and design livestock feed interventions at RDDP sites across Rwanda. The specific workshop objectives were to:

- Finalize FEAST reports
- Review FEAST reports and identify key problems in livestock feed production in six RDDP sites in Rwanda
- Identify 'best bet' feed interventions based on FEAST findings and 'best bet' rankings
- Develop a plan for the implementation of livestock feed interventions in different sites

A total of 19 participants attended the workshop drawn from Rwanda Agriculture and Animal Resources Development Board, University of Rwanda and the Rwanda Dairy Development Project. These participants were amongst those who attended the initial FEAST training (see above) and implemented FEAST in the six RDDP sites in Rwanda (see also above). In addition, six RDDP field officers coordinating RDDP activities including the Livestock

Farmer Field Schools (LFFS) from each of the sites were invited to attend the workshop since they would be implementing the selected interventions. They were drawn from Rubavu, Rutsiro, Gicumbi, Nyanza, Musanze and Nyagatare districts.

The workshop included field trips to Musanze and Nyagatare districts (20-21 May, 2019). The team was split in two and visited a total of four farmers per day (eight farmers in total). The sites were selected to cover the diversity of the production systems present in project sites. Musanze District has intensive production systems while Nyagatare is dominated by extensive grazing systems. The field visits were followed by working groups to design feed intervention (22-24 May 2019). Day three of the workshop focused on finalizing the FEAST reports drafted by teams following FEAST exercise in RDDP sites. The ILRI team worked with various FEAST teams to review the reports, interpret, discuss and present the results. The team took the opportunity to identify key feeds and feeding challenges and opportunities for each site. This exercise helped participants to understand the production systems better. Draft FEAST reports were then finalized and submitted to ILRI for further revision. These reports are currently being edited with a view to publishing them in an open access repository.

### 3. Implement feed interventions: Guiding and providing technical assistance during the implementation of feed interventions across six sites including L-FFS groups

A follow up visit to support the RDDP technical teams at the field sites was conducted in June 2019.

Implementation of this activity was hampered by lengthy delays in the agreement of the Year 2 annual workplan and budget. When the AWPB was finally agreed around March 2020, ILRI's Alan Duncan visited Kigali to discuss implementation of the agreed workplan. Activities were about to commence when the COVID-19 pandemic started in March 2020. Physical visits by ILRI staff were not possible for the remainder of 2020. As COVID-19 eased in late 2020, a virtual workshop of key local staff was organized in Dec 2020. The objectives of the workshop were to:

1. Review district feed constraint assessments
2. Validate the proposed interventions
3. Refine and agree next steps for the proposed feed intervention plans
4. Confirm plans to develop and support ration formulation data collection, guidelines and training

At the workshop it became apparent that feed interventions had continued through the COVID-19 pandemic and the emphasis shifted from designing interventions to monitoring and appraising interventions. Many of the interventions had been drawn from the intervention plans developed under Activity 2. The workshop was useful in setting the scene and orienting activities for monitoring of feed interventions as described below under Activity 5.

To provide further technical support on feed interventions at the training of trainers (ToT) event for key feed personnel in Rwanda, training was conducted on 28-28 April 2021. One crucial finding of the Gendered Feed Assessment Tool (G-FEAST) studies carried out in RDDP project areas was that dairy producers in Rwanda did not have access to information needed to improve dairy nutrition and that they did not understand dairy production. To address this information gap, ILRI adapted existing training materials with simplified technical information on various aspects of dairy production. This ToT sought to ensure that this technical information was delivered by extension service providers accurately and consistently. Its objectives were to prepare extension agents to present information effectively, respond to farmers' information needs, and carry out activities that reinforce learning. The learning goals were that by the end of the workshop participants should be able to:

- a. Explain the dairy value chain and the players at each level, the benefits of dairy farming and the process that should be followed when starting a dairy farm.

- b. Identify the different types of feed resources that can be used to feed dairy cattle, group them according to the major nutrient they supply and explain how the animal utilizes them.
- c. Learn the basics of calculating the feed requirements of different classes of dairy cattle and how to determine the quantities of available feed that can meet those requirements.
- d. Explain forage seed production, harvesting and storage.

The learning methodology involved:

- Plenary presentations and discussions
- Small group practical work and discussions
- Teach back

A number of observations were made at the training:

1. The training revealed knowledge gaps in master trainers that need to be addressed:
  - a. Knowledge gaps on optimum harvesting stages of forages and feed processing and conservation.
  - b. Need for data on the yield potential of forages being promoted in RDDP sites.
  - c. Simple guidelines for dairy rations balancing along with promotion efforts of improved forages. Related to this, there is a high demand for information on and knowledge on ration formulation
2. There is need to introduce more grazing cultivars in sites dominated by extensive systems e.g. Nyagatare District.
3. There is need for simple messages on water management and watering animals in extensive systems (for livestock herders and cattle owners).
4. There is need to investigate further reports that (*Chloris gayana*) is being attacked by aphids, while Kakamega I Napier grass seems to succumb to stunting disease.

#### **4. Orientation on cost-benefit analysis: Using virtual workshops, provide training and guidance on collection and analysis of data to assess economic feasibility of selected feed interventions.**

A virtual training of data collectors was organized 7-9 September 2021. The training was facilitated by Emily Ouma, an ILRI economist based in Uganda, and Louis Okello, an information management consultant in Uganda.

The main objectives of the virtual training were to:

- a. Strengthen the capacity of RDDP partner Institutions staff (RAB, UR and Rwanda Council of Veterinary Doctors ) who undertook the training on FEAST on how to design, plan and execute the cost-benefit analysis of feed interventions.
- b. Prepare the participants to collect electronically the data in the field for the survey on cost benefit analysis of feed interventions implemented by RDDP.

The training provided hands-on experience on the use of Open Data Kit (ODK), an open-source tool that allows data collection using mobile devices and data submission to an online server. Trainees were supported to download and install the tool on the provided tablets, and they then tested the forms (individual household and group or business level forms) during training sessions and the field pre-test.

The enumerators were taken through the tool using a step-by-step process and any issues or challenges were addressed directly. The review of the two questionnaires was first done on hard copies and thereafter using the forms on OKD implemented on the tablets.

Learning methods included:

- Plenary presentations and discussions
- Learning by doing
- Practical work and discussions
- Feedback

The trainers gave their presentations using PowerPoint and then the trainees discussed the content. At the end of each day's training, the trainees gave comments and suggestions for the next training sessions.

Field testing of the two survey instruments using the ODK tool on tablets was organized in Gicumbi District, in Byumba and Rutare Sector. Each enumerator interviewed one dairy farmer and one feed business (group/business level). A feedback session was organized the following day after the field pre-test to discuss the enumerators experiences in implementation of the tool and to answer questions.

**5. Monitor feed interventions: Monitoring the implementation of feed interventions in the selected sites using focus group discussions with men and women farmers know their perceptions of ongoing interventions, what the challenges or concerns are, collect information on prices, and find out what farmers have foregone due to the intervention, etc.**

Following the virtual workshop in Dec 2020 it was clear that a series of interventions were being rolled out in RDDP sites and attention turned to monitoring the implementation of those interventions and distilling learnings from the process to support their improvement. To this end a monitoring study was designed which involved organizing FGDs at each of the six focal sites of RDDP where ILRI was working. Using data from 29 sex-disaggregated FGDs across the six intervention sites, farmer perceptions regarding sustainability and impact were assessed. Results indicated that forage introductions saved labour, especially for women, which could be diverted to other economic and social activities. The interventions also improved social cohesion at study sites. However, land shortage was revealed as a key constraint to feed development in Rwanda and some fresh thinking about feed interventions may be needed (e.g. forage marketing to land-scarce farmers).

**6. Cost benefit analysis: In close collaboration with local scientists and livestock experts at SPIU/ RDDP, preparing, organizing and conducting the cost-benefit analysis of the selected livestock feed interventions**

Implementation of the CBA survey commenced during the week following the CBA training. All the 13 trained enumerators (six women and seven men) from RAB (nine staff), the University of Rwanda (two staff) and RRCVD (one staff) and ILRI local staff were involved in the data collection for the survey on CBA from 13 September– 11 November 2021 in the four districts (Gicumbi, Rubavu, Nyanza and Nyagatare) under RDDP scope, and two control districts (Kamonyi and Rulindo). The technical staff from ILRI (Emily Ouma and Louis Okello) continuously monitored the data quality submitted to the server.

For each interviewee (household or business), two copies of the consent form were signed by the respondent: one copy remained with the respondent while the other one was retained by ILRI for filing.

In total, 969 interviews were administered:

1. Gicumbi (172)
2. Nyagatare (157)
3. Nyanza (161)
4. Rubavu (142)
5. Kamonyi (167)
6. Rulindo (170)

## 7. Ration formulation:

- a. In close collaboration with local scientists and livestock experts at SPIU/RDDP, prepares, organizes, and conducts the training on diet formulation. Virtual format: 2-3 hours per day, for 2-3 days. Perhaps six technical participants with animal science background and also one or two village-based participants per site (e.g. from FFS group. Language issues need some further consideration).
- b. Modify OFA mobile app for Rwanda conditions. Need to identify resource persons to collect needed information.
- c. In close collaboration with local scientists, prepare a technical document (i.e. manual) on diet formulation guidelines especially for smallholder dairy farms.

One of the central findings of the G-FEAST studies carried out by ILRI in RDDP project areas is the lack of feed, both in terms of quantity and quality, which constrains dairy animal performance in Rwanda. Farmers generally feed their animals with roadside mixed grass and agricultural by-products and sometimes supplement with maize bran with little technical knowledge on the importance of balancing the diet. In this context, 'feed balancing' was included as one of the feed interventions under ILRI's technical support to the RDDP Project. Towards this, the extension advisors associated with RDDP were offered a 'training of trainers' on a mobile-based feed balancing application called 'On-farm Feed Advisor' (OFA), which was developed and field-tested by ILRI. The training was delivered on 27-29 October 2021.

The main objectives of the ToT workshop were to:

- a. Strengthen the capacity of RDDP staff, partner institutions' staff and extension field advisors from six districts under the MoU between RDDP and RDDP (District Animal Resources Officer (DARO) + Heifer International Rwanda (HIR) staff) on the use of On-farm Feed Advisor app to advise farmers for balancing dairy animal diets using locally available feed resources at cheaper cost.
- b. Prepare dairy extension agents to present information effectively, respond to farmers information needs, and carry out activities that reinforce learning.

The training provided hands-on training on the use of On-farm Feed Advisor tool. Trainees downloaded and installed the app on their own mobile phones and were then supported to try it out by applying case studies taken from hypothetical farmers from the six districts where data prices and nutritive values of available feeds had been collected.

The trainer took them step-by-step through the tool and any difficulties or issues or challenges were addressed directly by the trainer.

Learning methods included:

- Plenary presentations and discussions
- Small group practical work and discussions
- Teach back

The learning approach was participatory. The trainer made various presentations and then trainees discussed the content. At the end of each day's training, the trainees gave comments and suggestions for the next training sessions. In the morning of the next sessions, the trainer with the participants reviewed the training from the day before, the content they covered, the new things they learned and what impressed them most.

On the third day of the training, a field visit was organized to farms whereby five small groups of four to five participants each were tasked to visit a farmer and apply the tool. A feedback exercise was then conducted where trainees shared their experience with the tool.

In advance of the workshop, data on the main feeds available in each district and their nutritive value were collected and compiled by ILRI consultant Gilbert Mutoni and uploaded into the app to make it relevant to local conditions.

The app can be downloaded on the links below:

For Android: <https://play.google.com/store/apps/details?id=org.ilri.ilrifedadvisor>

For iOS: <https://apps.apple.com/in/app/on-farm-feed-advisor/id1570480676>

The Rwanda-specific district codes to log in the OFA app are as follows:

Rutsiro District: INAPRO

Rubavu District: INAPRU

Nyanza District: INAPNA

Nyagatare District: INAPNE

Musanze District: INAPME

At the end of the second day, on 28 October, the participants discussed a series of recommendations given by the resource persons (Padmakumar and Gilbert) based on the information gathered during field visits and interaction with farmers and extension advisors. The participants then identified a nodal agency/person responsible to take the actions forward.

## **8. Dairy feed training manual: Submitting the elaborated technical document for dairy cattle feeding to SPIU/RDDP**

There was considerable dialogue on the requirements for a dairy technical manual. The initial plan was to prepare a farmer-focused manual on feeding the dairy cow in the local language. However, it became apparent during discussions with RDDP staff that a similar manual was already in circulation and that producing a new one on the subject would duplicate it. It was therefore agreed to prepare a more technical manual suitable as a reference for extension staff. A consultant, Margaret Lukuyu, with considerable experience and expertise in livestock feeding in East Africa was engaged to prepare the manual. The manual was developed in English and extended to around 230 pages. It was shared with RDDP staff and Rwandan feed experts for review although feedback is still pending. Given the intended readership of the manual and the change in remit from the original intention, the manual remains in English language.

## **9. Outreach: In close collaboration with RDDP team, organizing a workshop/seminar to share findings from the researches with RDDP key stakeholders**

Plans for a final outreach workshop were curtailed by the emergence of the Omicron COVID-19 variant in Dec 2021. In place of this workshop a virtual webinar style meeting was organized early in 2022.

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#### **10. Project management – Overall coordination of the project and preparation of reports as stipulated in the agreement**

The project has been managed by Alan Duncan and reports have been submitted according to the agreed schedule. Internal project management has been through fortnightly check-in meetings for ILRI staff. Local liaison with RDDP staff has been facilitated by ILRI consultant Gilbert Mutoni.

## Livestock health

ILRI's support to RDDP was to strengthen national animal disease diagnostic capacity leading to disease control and certified safe milk in Rwanda. The activities conducted under livestock health included,

- i. assessment of training needs, equipment, staff resources and capacities, demand and needs in laboratory testing and analysis,
- ii. training of selected trainers in diagnostics as Training of Trainers (ToT),
- iii. development of training manual to be used by trainers to train laboratory technicians back in Rwanda,
- iv. support in the development of standard operating procedures (SoP) for each novel diagnostic test, and
- v. monitoring and evaluation for uptake of capacity building activities.

ILRI assessed RAB diagnostic facilities, staffing and lab management system and made some recommendations to strengthen the human and infrastructural capacity of RAB for animal disease diagnostics. In early 2020, three RAB staff were trained as ToT on molecular and serological diagnostics for brucellosis, foot-and-mouth disease, Rift Valley fever, African swine fever, mastitis and bovine tuberculosis; aflatoxins analysis in dairy feed and dairy products using ELISA, HPLC-FLD and LC-MS; milk composition analysis for detection of adulteration and herd health using MilkoFT scan technology; and introduction to laboratory quality systems management for a month at the ILRI Biosciences eastern and southern Africa (BecA) laboratory. ILRI developed a training manual with a detailed SoP on laboratory diagnostics methods, bioinformatics, nutritional analysis of milk for aflatoxins and antibiotic residues and quality management systems. This manual was used by ToT to train their colleagues at RAB's central lab and satellite labs.

A follow-up visit was made in December 2021 to assess dissemination of livestock diseases diagnostic assays by ToTs to staff in the central and satellite labs in Rwanda, and any changes in labs set-up and facilities as recommended at the beginning of the project. The assessment revealed these ToTs transferred microscopy, bacterial culture and serological techniques for animal diseases diagnostics; and noted some actions towards procurement of equipment, improvement in data management system, and lab infrastructure development.



## Barriers to progress

The main barriers to progress have been administrative delays in signing of agreements and restrictions on travel related to the COVID-19 pandemic in 2020/2021. Once new patterns of working were established within the constraints of COVID-19, the pace of activities has accelerated and considerable progress has been made especially in 2021.

# Opportunities

Having established relationships and a body of work related to feed supply for the Rwanda dairy sector there is considerable potential to build a further program of work. Potential activity areas could include:

## Livestock feed

1. Support development of Rwanda national forage seed system. Development of quality standards and training using ILRI's existing training modules.
2. Support for commercial forage production units/ forage marketing/ business models.
3. Scaling up digital and feed planning and interventions tools: G-FEAST, Tropical Forages Selection Tool, NIRS and OFA as packages in intervention sites;
4. Feed technologies to improve feed quality and management of dry season feed shortage.
- F5. Further research on costs and benefits of feed interventions building on preliminary findings.

## Livestock health

1. Regular training of RAB researchers to keep abreast with new developments in the areas of livestock health including animal diseases diagnosis.
2. Enhance infrastructure and the capacity of the satellite laboratories to perform essential tests such as ELISA.
3. Review, standardize, update and harmonize SOPs.
4. Provision for internal and external quality assessment (proficiency tests) Internal Quality Assurance/External Quality Assurance (IQA/EQA) to include more assays in molecular diagnostics, tissue culture and serological assays.
5. Enhance safety of personnel involved in livestock health research and development activities e.g. vaccinations for staff handling samples (rabies, brucellosis, tuberculosis, hepatitis).

## Conclusion

ILRI's support to RDDP feed activities has been a learning experience on both sides. Despite the limitations imposed by the global COVID-19 pandemic a useful set of activities has been implemented with a strong emphasis on developing a systematic approach to feed intervention design and implementation along with developing capacity of local personnel including from the national research system as well as the LFFS. Support for the national animal disease diagnostic capacity also proceeded according to plan. The suite of activities and the relationships built provide a good base for further engagement and are also translatable to other country contexts.

ISBN: 92-9146-724-3



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