

Adoption of Good Manufacturing Practices in Feed Production among trained Small Scale Feed Producers in Uganda



INITIATIVE ON
Sustainable Animal
Productivity

Uganda Pig Value Chain

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2024



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Acknowledgements

This work was conducted as part of the CGIAR Initiative on Sustainable Animal Productivity for Livelihoods, Nutrition and Gender Inclusion (SAPLING). CGIAR research is supported by contributions to the [CGIAR Trust Fund](#). CGIAR is a global research partnership for a food-secure future dedicated to transforming food, land, and water systems in a climate crisis.

Outcome

The feed manufacturing industry plays a crucial role in ensuring the availability of high-quality animal feed, which is essential for the health and productivity of livestock. The livestock feed sector in Uganda is mostly controlled by small-scale companies who offer costly, inadequate feeds, leaving farmers with few choices (Graffham et al., 2003). The rise and expansion of small-scale feed producers has transformed concentrate feed production, offering opportunities to these producers while simultaneously presenting challenges such as insufficient technical expertise in feed formulation and mixing, unregulated concentrate feed production and distribution, resulting in the manufacture of costly and substandard commercial feeds. The costly, low-quality feed adversely impacts farm productivity, production costs and, consequently, farmers' incomes.

An intervention was implemented with feed producers in two phases across the Kampala, Masaka, and Mukono districts. In the first phase, small-scale feed producers were selected and trained in principles of feed formulation, as part of the More Pork initiative project. In the second phase, under the SAPLING initiative, the trained small scale feed producers were mentored on good feed manufacturing practices (GMP) for feed production for 8 months. They were assessed for their adherence to the procedures they had learned. The results indicate that, in addition to those who were already following certain GMPs, a larger number of feed producers are now compliant with most of the practices.

Partners

The partners involved in this intervention included Single Spark, which provided training and mentorship to feed producers in Mukono, Kampala, and Masaka districts on Good Manufacturing Practices. Additionally, district veterinary officers from the respective areas conducted the surveys.

Why did we do this research?

This research was implemented to assess whether trained and mentored feed producers demonstrate an improvement in adherence to good feed manufacturing practices. This report examines the change in practices by feed producers following a training and mentorship program in Uganda, focusing on areas such as sourcing of raw materials, storage of raw feed ingredients, grinding and processing raw materials, feed formulation, accurate measurements of feeds and ingredients, blending, mixing, storage, and distribution.

Evidence

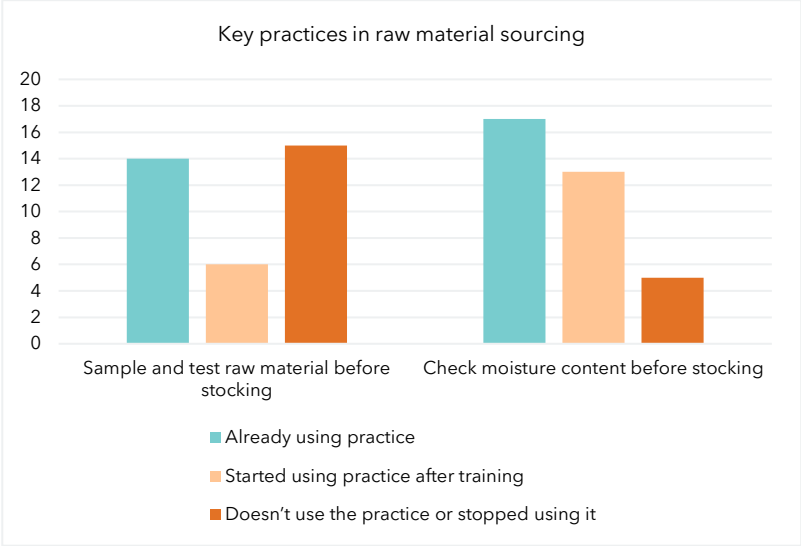
This section will highlight key practices from various feed production stages as evidence of the adoption or non-adoption of good manufacturing practices (GMP) among the trained small-scale feed producers. Of the 40 trained and mentored small-in Kampala, Mukono, and Masaka districts, 35 were actively engaged in animal feed production at the time of the survey.

Key GMPs at sourcing of raw materials

The results indicate a mixed response among feed producers regarding the adoption of feed ingredient testing practices after receiving training and mentorship. Out of the participating feed producers, 14 had tested the

ingredients prior to training, while 15 did not. Post-training, only six feed producers began testing their feed ingredients. However, there was a notable improvement in the assessment of moisture content, with 13 out of 18 previously non-compliant producers adopting this practice after the training. The main barriers to compliance included a lack of awareness about where to conduct feed quality tests and the perceived high costs associated with these tests as indicated in Figure 1.

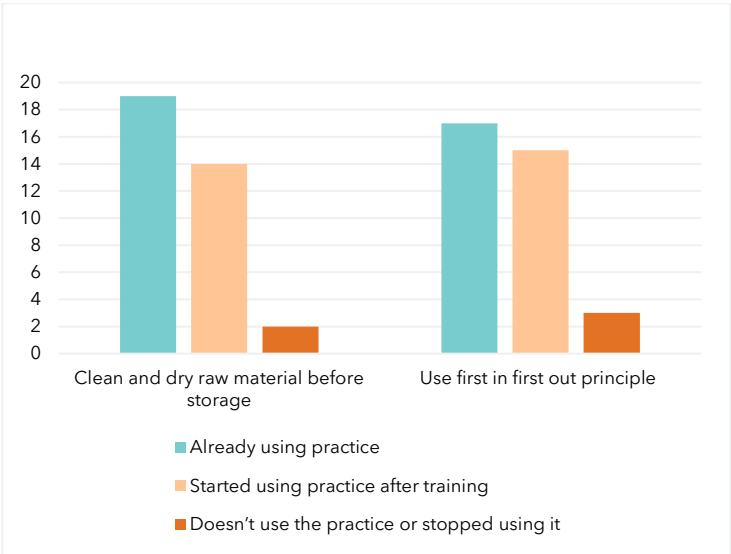
Figure 1: Number of feed producers complying to key GMP at raw material sourcing



Key GMPs at storage of feed raw ingredients

Several feed companies have successfully implemented the *first-in, first-out* principle and the practice of cleaning and drying feed components prior to storage. Following a training and mentorship program, feed producers have adopted these techniques and continue to use them effectively. However, despite receiving training on the importance of storing raw materials in properly labeled bags, nearly 50% of the trained producers still do not adhere to this guideline. As seen in Figure 2, some feed producers remain unconvinced of the necessity, while others believe that correctly labeling bagged materials necessitates a financial expense, they are now unable to incur.

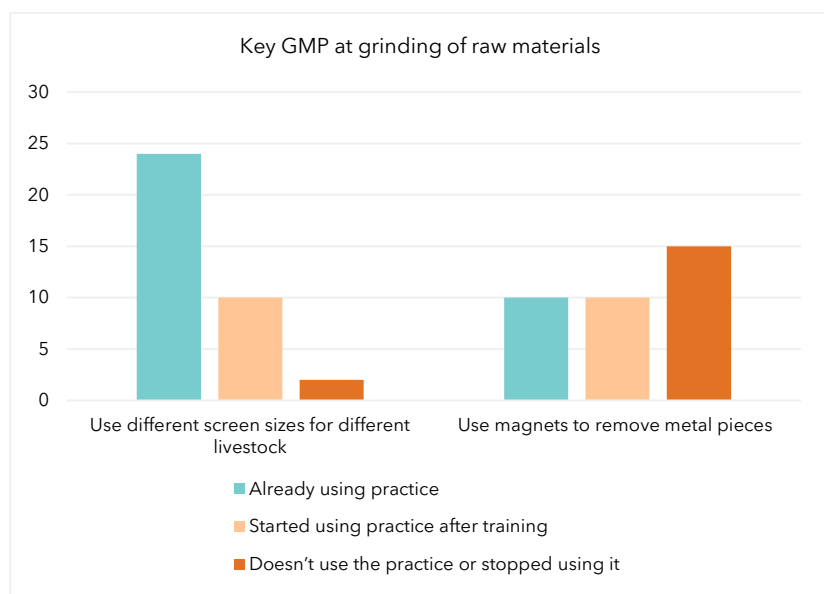
Figure 2: Number of feed producers complying to key GMP at storage of raw material



Key GMPs at grinding and processing raw materials

The results indicate that 24 feed producers were already employing various mesh particle sizes for grinding feed tailored to different livestock, based on their age and type. Following a training session, an additional 10 feed producers began using different mesh particle screens. Additionally, nearly half of the feed enterprises chose not to use magnets at the inlets during production, while ten enterprises consistently implemented this method at this stage. The feed manufacturers asserted that they lacked the financial resources to invest in equipment upgrades while simultaneously maintaining commercial operations, and as demonstrated in Figure 3, some still don't see the necessity of using magnets to eliminate metals from the feed.

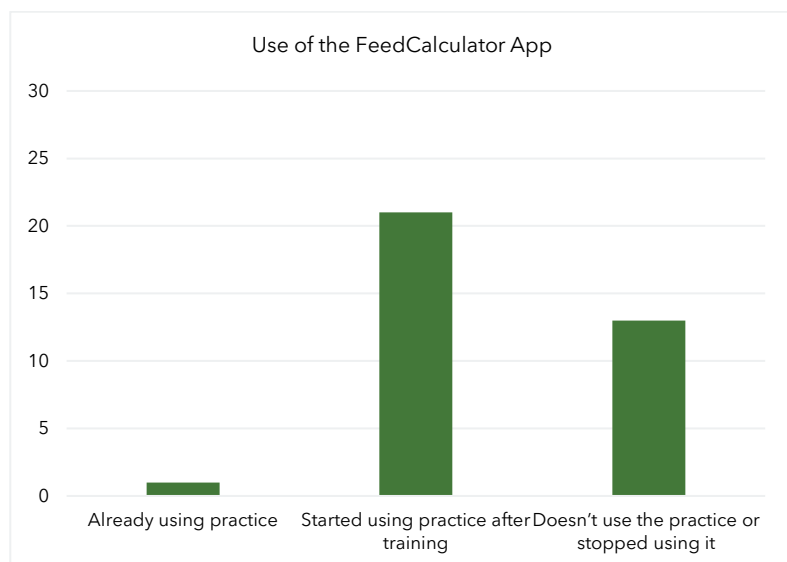
Figure 3: Number of feed producers complying to key GMP at grinding of raw material



Key GMPs at feed formulation

The implementation of the feed formulation calculator Application has proven successful, as it was introduced as a recommended tool for feed producers who received training on its usage. Initially, only one producer was using the App, but after training, this number rose to 21 active users. However, 13 producers have not adopted the App; of these, nine had previously used it but stopped due to concerns about the accuracy of the feed rations generated. Issues with the Application's effectiveness may stem from the adulteration of feed ingredients, which can lead to formulations that do not meet animal production needs. Additionally, some producers preferred to rely on their established feed formulas that had previously shown success, in terms of breaking even for both producer and farmer, rather than adopting use of new technology as illustrated in Figure 4.

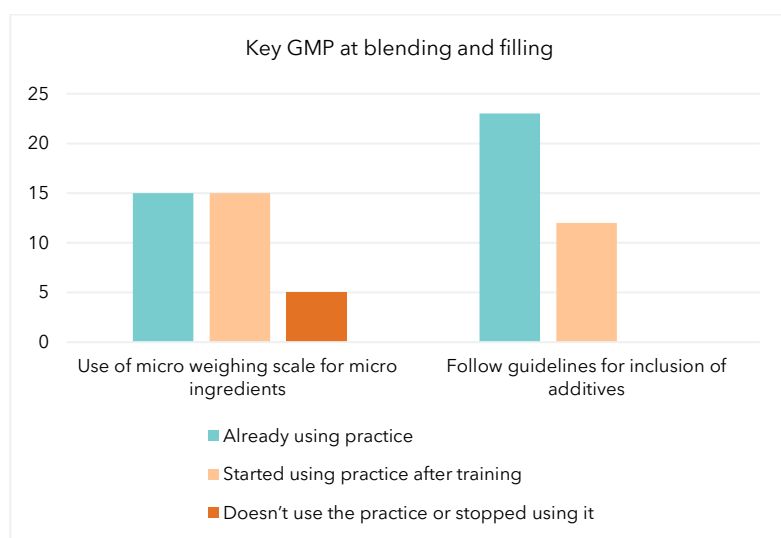
Figure 4: Number of feed producers complying to use of feed calculator



Key GMPs at Blending and Filling

The results highlight the importance of precise measurement in feed formulation, emphasizing the need for accurate weighing scales for both micro and macro ingredients. Following training, 15 feed manufacturers adopted micro weighing scales for measuring micro ingredients, demonstrating a commitment to improving their practices through investment in these tools. Additionally, 12 feed companies began following established guidelines for incorporating additives during the blending and filling processes, indicating a broader shift towards adherence to best practices in feed manufacturing as illustrated in Figure 5.

Figure 5: Number of feed producers complying to key GMP at blending and filling of feed ingredients

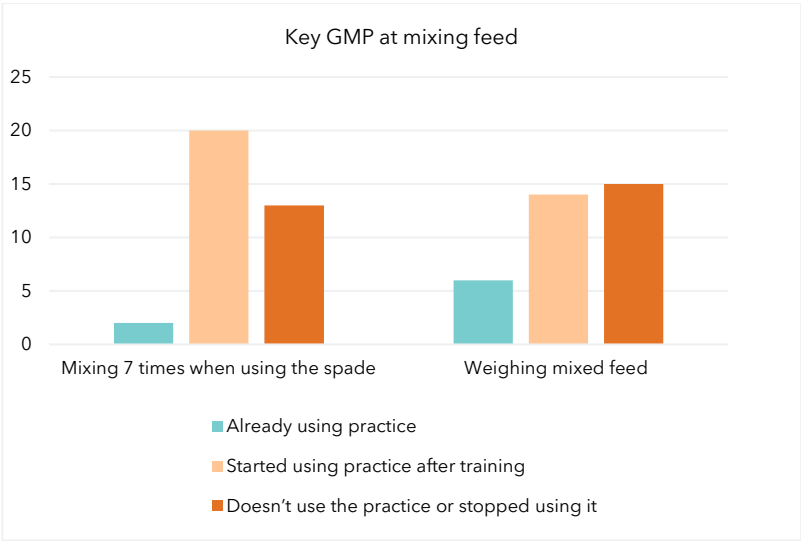


Key GMPs at Mixing

The study on feed mixing practices reveals that most feed enterprises use spades for mixing, with a recommendation to mix the feed seven times for optimal results. Out of the surveyed feed producers, 18 have adopted this mixing technique, while 13 have not. The main barriers to adoption include customer urgency and

skepticism about the technique's necessity. Figure 6 shows that only six producers measured the quality of the mixed feed post-mixing. After training, there was an increase in the number of producers adopting the mixing practice, although an equal number still chose to disregard it.

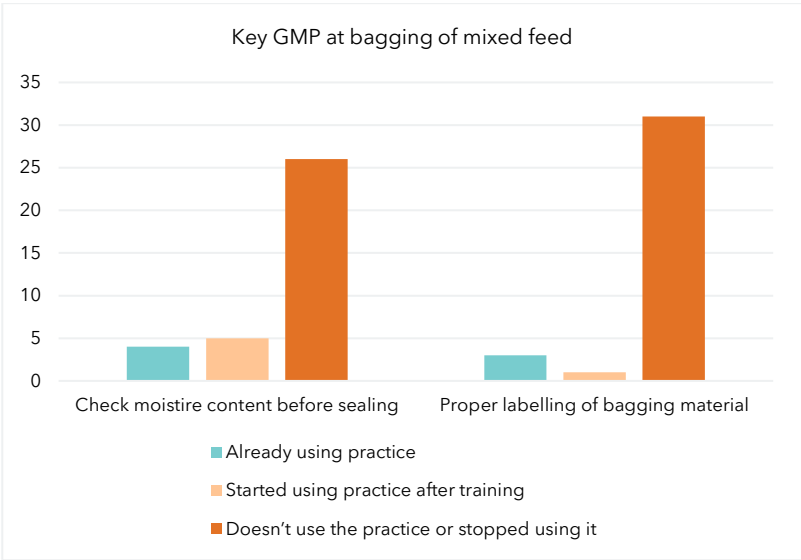
Figure 6: Number of feed producers complying to key GMP at mixing of feed



Key GMPs at Bagging

Despite training on the importance of verifying moisture content and proper labeling of storage bags, many feed manufacturers fail to adhere to these essential protocols as shown in Figure 7. The main reasons for this non-compliance include a belief that these practices are unnecessary, limited financial resources to purchase the required equipment, and a lack of time to implement them due to the fast-paced nature of feed production.

Figure 7: Number of feed producers complying to key GMP at bagging of mixed feed

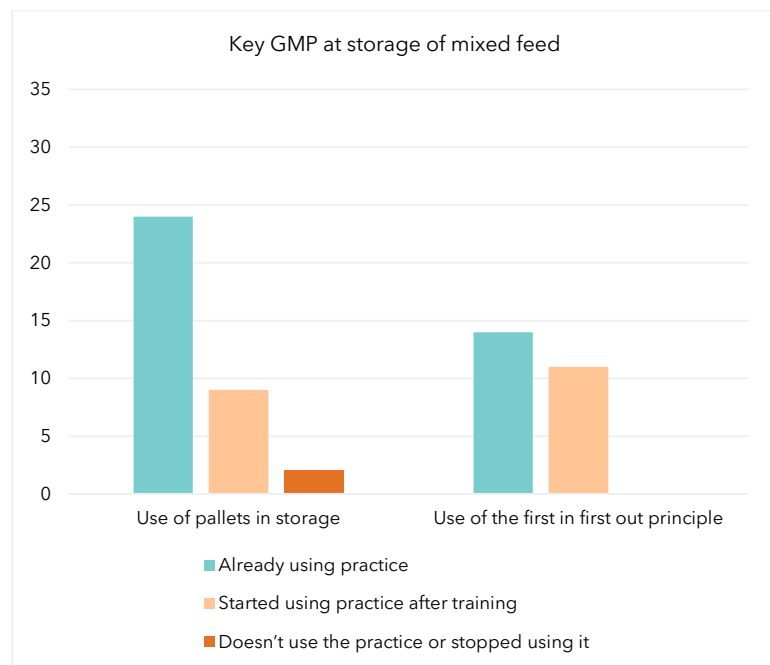


Key GMP at storage of mixed feed

According to the Good manufacturing practices and quality assurance handbook for small- and medium-sized feed mills in Uganda handbook, the two key good manufacturing practices at this stage include i) Following *first-*

in, first-out (FIFO) principle in feed stores and ii) Storing feeds in well labelled bags on pallets to ensure reduced spoilage of feed while in store (Isiko et al., 2022). The findings indicate that many feed businesses have already adopted recommended practices for feed manufacturing, such as using pallets for storage and following the first-in, first-out principle. Figure 8 shows that the implementation of these methods increased further among feed producers after participating in a training and mentorship program.

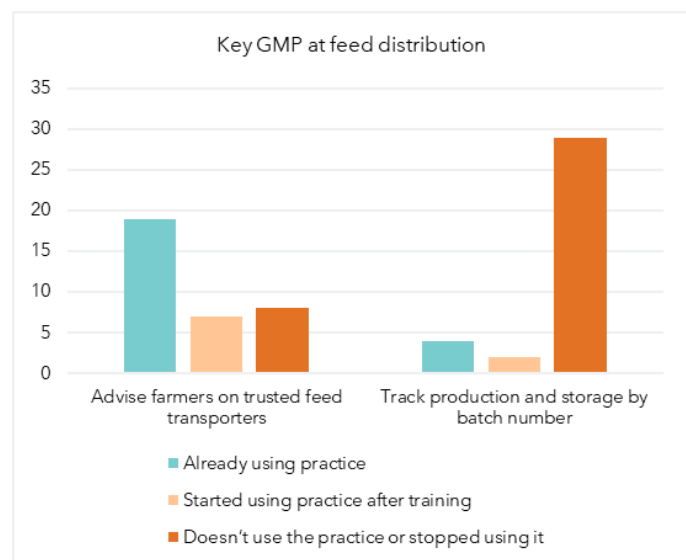
Figure 8: Number of feed producers complying to key GMP storage of mixed feed



Key GMPs at feed distribution

A synthesis of the results indicates that prior to training sessions, over half of feed producers were already advising farmers on reliable transporters for feed. Following the training, seven additional feed producers adopted this practice, while an equal number still did not as seen in Figure 9. In terms of tracking production and storage by batch number, 29 feed manufacturers continue to neglect this practice, likely since most do not store feed in properly labeled sacks.

Figure 9: Number of feed producers complying to key GMP at feed distribution



Synthesis

The findings from this research suggest that the training and mentorship program has been largely effective. A significant number of feed producers are now compliant with good manufacturing practices, in addition to those who were already adhering to certain standards. However, the results regarding raw material sourcing reveal a mixed response among the trained producers; while some have enhanced their sourcing practices, others continue to face challenges in acquiring quality inputs. The intervention has positively influenced producers' awareness and usage of financial services, which are essential for sustaining and enhancing their operations.

The adoption of feed ingredient testing practices among producers after training has shown varied results, highlighting the necessity for ongoing support and monitoring to ensure that small-scale feed producers uphold the improved practices and quality control measures they have learned.

The storage and processing of raw feed ingredients play a vital role in livestock feed production, significantly affecting the quality and nutritional value of the final product. Several feed companies have successfully implemented the *first-in, first-out* principle and have adopted practices such as cleaning and drying feed components before storage, which has proven beneficial (Lip & Rashid, 2020). However, despite training on proper storage practices, nearly 50% of the trained producers have not consistently adhered to these guidelines.

Grinding and processing raw materials are other critical steps in feed production. Twenty-four feed producers were already utilizing various mesh particle sizes for grinding feed tailored to different livestock based on age and type. Post-training, an additional ten producers began using different mesh particle screens. Nevertheless, nearly half of the feed enterprises opted not to use magnets at the inlets during production, which could help eliminate metal contaminants (Lip & Rashid, 2020; Ziegler et al., 2021).

The introduction of a feed formulation calculator Application has proven successful, as it was recommended as a valuable tool for trained feed producers. Initially, only one producer utilized the App, but this number increased to 21 active users after training. However, 13 producers have not adopted the application; among them, nine previously used it but ceased due to concerns about the accuracy of the generated feed rations. This underscores the need to promote the use of feed formulation calculator Applications while addressing concerns about accuracy and offering support for effective implementation.

Following the training and mentoring, 15 feed manufacturers adopted micro weighing scales for measuring micro ingredients, reflecting a commitment to enhancing their practices through investment in these tools. The results stress the importance of precise measurement in feed formulation, which requires accurate feed ingredient composition data and effective quality control measures throughout the production process. Additionally, 12 more feed companies began adhering to established guidelines for incorporating additives during blending and filling, indicating a broader shift towards best practices in feed manufacturing.

Regarding feed mixing practices, most feed enterprises utilize spades for mixing, with a recommendation to mix the feed seven times for optimal results. Among the surveyed producers, 18 have adopted this technique, while 13 have not, citing customer urgency and skepticism about the technique's necessity as primary barriers. Notably, only six producers measured the quality of the mixed feed post-mixing. While there was an increase in producers adopting the recommended mixing practice after training, an equal number still opted not to implement it.

On storage practices, findings indicate that many feed businesses have adopted recommended practices like the *first-in, first-out* principle, with implementation further increasing among producers who participated in the training and mentorship program. In terms of transportation, the results show that prior to the training sessions,

over half of the feed producers were already advising farmers on reliable transporters for feed. After the training, seven additional producers adopted this practice, although an equal number chose not to implement it.

Overall, the study emphasizes the need for continuous efforts to enhance feed manufacturing practices, including precise measurement techniques, adherence to blending and mixing guidelines, and the implementation of safe storage and distribution methods.

Implications

The study findings have several implications for the livestock feed sector in Uganda.

First, the success of the training and mentoring approach suggests that targeted capacity-building interventions can be effective in improving the quality and safety of commercial animal feeds produced by small-scale enterprises (Bentley et al., 2020). This highlights the potential for similar interventions to be scaled up and replicated in other regions to address the broader challenges in the livestock feed sector.

Second, the mixed response on the adoption of feed ingredient testing practices suggests the need for more comprehensive and long-term support to ensure that small-scale feed producers maintain the improved practices and quality control measures they have learned. This could involve, for example, providing ongoing technical assistance, facilitating access to testing facilities, and strengthening regulatory frameworks to incentivize and enforce good manufacturing practices.

Third, the findings underscore the importance of addressing the root causes of the challenges facing the livestock feed sector in Uganda, such as the lack of technical expertise, unregulated production and distribution, and the predominance of small-scale enterprises. Addressing these systemic issues will require a multifaceted approach that involves collaboration among government, industry, and development partners (Alonso et al., 2018); (Mariyono, 2019); (Didanna et al., 2018).

In conclusion, this research highlights the potential for targeted capacity-building interventions to improve the adherence to good manufacturing practices among small-scale feed producers in Uganda. However, sustainable improvements will require more comprehensive and long-term support, as well as addressing the underlying structural and regulatory challenges in the livestock feed sector. (Preston, 1998); Apantaku et al., 2006); (Nguz, 2005)

Recommendations

- These findings suggest that capacity-building initiatives, such as the one implemented in this case, can be effective in improving adherence to good manufacturing practices and promoting more sustainable and profitable feed production among small-scale producers. However, the heterogeneity in the results indicates that the impact may vary depending on the pre-existing socioeconomic conditions of the feed producers
- Ongoing support, targeted interventions, and a multifaceted approach may be necessary to address the complex challenges faced by small-scale feed producers and achieve more consistent and long-lasting improvements in the sector, (Bentley et al., 2020); (Desai & Joshi, 2013); (Alonso et al., 2018); (Makuma-Massa et al., 2020).

Next steps

- We will organize feedback sessions with feed producers to share results and to better identify the challenges hindering the adoption of innovations and best practices. This will help us improve our efforts to address these constraints.
- As part of our sustainability strategy, we will partner with the Africa Institute for Strategic Resource Services and Development (AFRISA) to investigate the creation of a commercial course within their curriculum aimed at training additional feed producers.

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We would like to thank all funders who support this research through their contributions to the CGIAR Trust Fund: www.cgiar.org/funders.

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