WFP EVALUATION

Innovative Pilot Evaluation: Aflatoxin Reduction in the Rwanda Maize Value Chain from October to December 2021

Decentralized Evaluation Report

WFP Regional Bureau of Nairobi

February 2022

WFP
World Food Programme
SAVING LIVES
CHANGING LIVES

Key personnel for the evaluation

WFP Regional Bureau of Nairobi

Gabrielle Tremblay, Evaluation Manager

Prepared by

David Coombs, Team Leader

Marian Meller, Deputy Team Leader

Roberte Isimbi, National Evaluator

Elie Nsabimana, National Evaluator

Maria Bucciarelli, Researcher

Alexander Mewes, Researcher

Acknowledgements

The evaluation team would like to thank the WFP Regional Bureau of Nairobi, the WFP Country Office and the Farm to Market Alliance in Rwanda, as well as the AflaSight team, for their excellent support and assistance throughout the evaluation. The information and data shared by them – and many other public and private sector stakeholders – has been of great value for this evaluation. The fieldwork and survey in the South of Rwanda would not have been possible without the comprehensive support received from the WFP Field Office in Huye and the survey team of the Institute of Policy Analysis and Research. The team also extends special thanks to the cooperatives and smallholder farmers who generously gave their time, information, and opinions during the data collection.

Disclaimer

CONTENTS

List of figures

List of tables

List of boxes

Executive Summary

1. The subject of this decentralized evaluation is AflaSight, an innovative pilot activity for aflatoxin reduction in the maize value chain of Rwanda. The evaluation was commissioned in November 2020 by the Regional Bureau of Nairobi (RBN) of the World Food Programme (WFP) in collaboration with the WFP-led Farm to Market Alliance (FtMA) and the WFP Rwanda Country Office (CO). It serves the dual purpose of learning and accountability. Changes in the timeline increased the focus on learning, with relatively more weight on forward-looking elements than on accountability and past performance.

2. Rwanda has a large workforce of smallholder farmers (SHFs) but who have limited access to premium markets for maize. One barrier to market access is aflatoxin, a carcinogen produced by Aspergillus fungi which thrive in a variety of crops and grains when stored in humid conditions due to poor post-harvest handling and storage, and lack of efficient drying facilities. There is no currently available way to recognise kernels affected with aflatoxin and screen it out. Maize grain with high levels of aflatoxin is rejected by premium buyers adhering to regional and national aflatoxin standards, producing income losses for SHFs. WFP's work on smallholder market integration and aflatoxin control in Rwanda (much of which is implemented through FtMA) aims to address these issues.

3. In this context, AflaSight (operated by a start-up firm based in Rwanda) uses an innovative aflatoxin reduction technology developed by a multinational plant equipment manufacturer (Bühler). The technology (LumoVision) removes aflatoxin from already infected maize kernels at industrial scale. The direct users of AflaSight are agro-processors and traders that source maize from smallholder cooperatives.

4. The installation and calibration of the processing line in the Special Economic Zone of Kigali was finalised with substantial delay in October 2021. This delay, and time constraints related to the evaluation budget, shifted and shortened the originally planned evaluation period (February to August 2021, main agricultural seasons A and B) to October to December 2021 (the first three months of the pilot, minor season C). The geographic and value chain scope of the evaluation includes processors, aggregators and other food system actors based in Kigali, as well as four 'pilot cooperatives' active in season C in the Southern Province of Rwanda. The main users of the evaluation are WFP CO and RBN, FtMA, Government institutions involved in agricultural production and food standards, AflaSight, Bühler and private entities (including cooperatives) forming parts of the maize value chain.

5. The evaluation followed a theory-based mixed methods approach to answer the nine main evaluation questions (EQs). Primary data was collected in November and December through key informant interviews in Kigali, as well as interviews, focus groups, direct observation, and a large-scale survey with SHFs in the Gisagara and Nyanza districts. The main methodological limitations were related to the timing of the evaluation (beyond control of the evaluation team) which substantially limited stakeholder's (especially SHFs') experiences with AflaSight at outcome and impact levels. Uncertainty about the future course of the pilot and its effects remain. Moreover, given that AflaSight has so far only worked with a limited set of four cooperatives – all in one region, already supported by FtMA, and only active in season C –, the external validity of results on SHFs is limited.

FINDINGS

EQ 1 – Relevance: To what extent is the pilot activity appropriate for the realities and needs of the targeted beneficiaries, including smallholder farmers, specifically women, as well as other value chain actors?

6. The pilot offers a solution to the widespread problem of aflatoxin. It complements existing approaches to aflatoxin reduction, such as adequate post-harvest handling and storage (PHHS) practices promoted by FtMA. The pilot is closely aligned with the relevant policies and strategies of WFP and Government to ensure safe food and support for SHFs. SHFs and all other members of the maize value chain have an opportunity to benefit from the technology.

EQ 2 – Relevance: To what extent is the introduction and use of the technology accepted, understood by, and accessible for smallholder farmers (especially women) and other stakeholders?

7. Smallholder farmers were only being made aware of the technology at the end of evaluation period and processing of smallholder grain began thereafter. Traders, processors and government are generally positive about the potential value of the technology.

EQ 3 – Efficiency: Is the pilot activity cost-effective in terms of higher-level outcomes (reduction in aflatoxin levels, smallholder integration in maize value chains)?

8. For agro-processors, AflaSight is the least costly solution for aflatoxin reduction if they choose to offset the additional costs of the process by buying contaminated grain from coops at sufficiently low prices. Cost-effectiveness calculations suggest that the required price discount is only half of the current price difference between premium and local markets – sharing of profits from the technology between buyers and coops is thus in principle possible.

EQ 4 – Effectiveness: How well does the LumoVision technology and its related processes perform in the local context, and what factors influence its effectiveness in achieving the technical objectives?

9. The technology has shown its ability to reduce aflatoxin levels. The average reductions so far are 72 percent for grain from season B stored by traders and 55 percent for fresh harvest from season C while weight loss from optical sorting is typically below 5 percent. Results for season A may be different. The first batches of commercial grain from a cooperative have been converted from low to high quality by the technology with no failures.

EQ 5 – Effectiveness: To what extent will the technology help smallholder farmers (especially women) to connect with premium buyers, why and how, and what enabling or disabling factors are present?

10. The technology allows agro-processors to source a larger share of their demand for high-quality maize domestically. This additional demand will increase connections between coops and premium buyers. Premium buyers might want to first 'test' the technology with coops that already apply sound PHHS practices before connecting with coops that face larger aflatoxin problems. FtMA support (PHHS, information on AflaSight, etc.) plays an important role in creating the conditions for linking coops to premium buyers. No major disadvantages from the technology have been identified for farmers.

EQ 6 – Impact: What effects, or emerging effects, are being realized for smallholder farmer livelihoods, especially for women?

11. Any grain that would previously have been rejected (but can now reach premium markets) can bring additional income for smallholder farmers, provided that premium buyers share their gains from the technology with farmers. This requires cooperatives to connect with direct users of AflaSight and be sufficiently informed about the technology and the aflatoxin levels of their harvest to negotiate their profit share. These conditions that are not fully met yet. While it is too early to know the magnitude of the income effect on farmers, AflaSight will make the biggest income difference for farmers with contaminated grain that would otherwise marginally fail the acceptance threshold. Any income increase, once achieved, is likely to continue in the future and increase farmers' investment in agricultural production and livestock, human capital, and savings/insurance management.

EQ 7 – Impact: What are the likely outcomes within the wider market systems and maize value chain?

12. Increased domestic high-quality grain production should reduce input costs for processors and may contribute to improved profitability, lower food prices, and increased exports of food products. Smaller unregulated mills and food producers will produce less contaminated food.

EQ 8 – Sustainability: Is the pilot activity based on realistic assumptions, is it technically and financially viable, and should it be scaled up – and if so, what could be scaled, how, and why?

13. The business model for AflaSight seems realistic but the high fixed costs attached to the machine mean that the throughput for each machine must be high to support the costs. It is too early to assess demand but if it is sufficient, then the pilot should be scaled-up.

EQ 9 – Sustainability: Are there adequate local capacity and institutional arrangements to sustainably continue the operations?

14. There are adequate aggregation and storage facilities in the country to allow for the scale-up. Government has been very supportive of the pilot so far and this is likely to continue.

CONCLUSIONS

Conclusion 1: Aflatoxin is a major problem in Rwanda and optical sorting has the potential to make a big contribution and generate direct or indirect benefits for all members of the maize value chain.

15. Contaminated grain is widespread due to poor storage and drying facilities combined with high rainfall. The Buhler LumoVision is the first technology to offer effective sorting of high volumes of grain to

remove aflatoxin. The main direct users and beneficiaries of the technology are likely to be agro-processors and traders while the potential benefits for coops and SHFs are indirect.

Conclusion 2: The machine's performance in the pilot so far is likely to be sufficient to reduce aflatoxin levels in grain and provide a cost-effective solution for increasing the volume of domestic grain available to processors.

16. After only two months of operation – not including the main agricultural season A –, the machine is able to remove 80-90 percent of affected grains from the most contaminated stocks. The operating costs are sufficiently low for processing to be financially worthwhile with current grain prices.

Conclusion 3: AflaSight should enable farmers to sell a larger quantity of grain to premium markets, and increase their income, provided that they are able to connect – and negotiate higher farmgate prices for aflatoxin-affected grain – with the direct users of AflaSight.

17. Farmers will not use the process directly but will benefit whenever they can sell moderately contaminated grain that would otherwise have been sold to informal markets to buyers use AflaSight and gain a premium price. Whether buyers will share the profits from the technology with farmers will depend on the negotiation capacity of farmers, which is currently limited by information gaps related to AflaSight and the aflatoxin levels of their produce.

Conclusion 4: Women and men have equal access to the technology, but they may benefit from it somewhat differently although it is too early to tell with certainty.

18. Women are reported to be more diligent at looking after their crops and better at following coop guidelines and rules for PHHS and aflatoxin prevention. If this causes lower rejection rates their grain will not need to use the AflaSight process.

Conclusion 5: There are many potential advantages for consumers and the economy.

19. An increase in Rwandan maize that meets the aflatoxin standards means that more domestic grain will be used for food and the benefits will also trickle down to small millers and producers, who will eventually receive higher quality maize also and so produce safer food.

Conclusion 6: FtMA will play an important role in the introduction of AflaSight to guide farmers and coops as to how they maximise their chances to sell to processors and share the value added from the technology.

20. FtMA already work closely with coops and can ensure that farmers use their bargaining strength to receive back part of the benefit attached to upgrading the seed.

Conclusion 7: The pilot clearly needs to continue for several more months to gain more experience with the process itself, learn how value chain members make use of it, and make decisions on scaling up.

21. The technology has only been running for a short time and needs probably six months more to generate sufficient results to make decisions about scaling up. Potentially high fixed costs mean that AflaSight will need to ensure that there is a strong (demand driven) market before scaling up to ensure sufficient throughput.

RECOMMENDATIONS

Recommendation 1 (high priority – to be implemented immediately until the end of 2023):