

ACTION AGAINST HUNGER'S PILOT: LONG CONSERVATION BAGS TO REDUCE FOOD LOSS & PLASTIC USE IN MADAGASCAR

This case study documents Action Against Hunger's experience when changing from polypropylene woven bags to kraft paper bags for the conservation of crops and seeds in their agricultural support program in Madagascar. It outlines the benefits and challenges of this approach, as well as recommendations for the future.



BACKGROUND

In Madagascar and throughout sub-Saharan Africa, food losses (estimated between 30 and 40 percent of total production) significantly contribute to food insecurity, malnutrition and poverty.¹ The majority of these losses are caused by insects and humidity during storage, processing, or transport. As a result, some farmers are forced to sell their crops at harvest time when prices are at their lowest, and months later are forced to buy the same crops back for their own consumption when prices are at their highest, creating a vicious cycle of poverty.²

In addition to this issue, both the land and the sea in Madagascar have been polluted by plastic³ leading the Ministry of the Environment to adopt a 2017 law regulating the use and production of plastic bags with a thickness equal to or less than 0.05mm.⁴

In this context, humanitarian and development organizations working in Madagascar are conscious of the need to reduce the environmental impact of their programs, including through the use of more environmentally friendly packaging, while also increasing the sustainability of their programs.

Action Against Hunger ([Action Contre La Faim/ACF](#)) has been present in Madagascar since 2011. In 2019, ACF began implementing a vast agricultural support program ([AFAFI Sud](#)) funded by the European Union in three regions of the south and southeast of the country. As part of a project aimed at helping farmers multiply seeds and improve storage techniques, ACF decided to begin distributing bags made out of kraft paper to Malagasy farmers, instead of woven polypropylene (PP) bags.⁵ These



Malagasy farmer involved in the ACF program (credit: ACF Madagascar)

¹ <https://www.fao.org/in-action/seeking-end-to-loss-and-waste-of-food-along-production-chain/en/>

² <https://www.one.org/stories/food-loss-waste-madagascar/>

³ "Madagascar et le sud de l'océan Indien particulièrement exposés à la pollution plastique." RFI, October 2022(French).

⁴ [Décret No. 2017-010](#), Ministry of the Environment, Ecology and Forests, 2017(French).

⁵ ACF distributed 8512 and 5000 PP bags with an average capacity of 30 kg in 2022 and 2023 respectively.

bags – developed by small social enterprise [Tigoun](#) – also use new technology to prevent insect infestation.

ACF's aim was twofold: to reduce its environmental impact and use of plastic, and to combat postharvest losses caused by insects and humidity.



PROCESS

Tigoun is Malagasy social enterprise, based in France and Madagascar. Its production site is currently in France, although there are plans to move operations to Madagascar to be able to supply bags to other African countries. Its bags are certified by [ISO 22000](#) and by the [Programme for the Endorsement of Forest Certification](#), made from 80 percent kraft paper, and have an internal barrier layer made of plastic that provides crops and seeds with protection from insects, moisture, and mold. The bags are sealed using a rope attached to the bag.



SPECIFICATIONS OF TIGOUN BAGS USED BY ACF IN MADAGASCAR⁶

- Materials: kraft paper and an airtight plastic layer
- Made of 80% biodegradable materials
- Made from 80% renewable materials
- Number of layers: 4 (3 layers of kraft paper and 1 barrier layer)
- Color: brown (kraft)
- Weight of one bag: 389 g
- Dimensions: 109 x 55 cm
- Capacity: 50 kg
- Oxygen transmission rate (OTR): <math><4 \text{ cm}^3/\text{m}^2/24\text{h}</math> at 0.1 Mpa
- Water vapor transmission rate (WVTR): <math><7 \text{ g}/\text{m}^2/24\text{h}</math> (at 38°C - 90%HR)
- Lifespan: >10 years



BENEFITS

Reduction of postharvest losses: The oxygen-tight technology in the Tigoun bags ensures insects, including eggs and larvae, die from asphyxiation without the need for pre-evacuation or the use of chemicals. Furthermore, the materials used in the bags have water vapor barrier properties, helping to keep their contents dry. It is estimated that postharvest losses among Malagasy farmers have been reduced from 50 percent with the woven PP bags to 1 percent with Tigoun bags.⁷ This in turn leads to a reduction in carbon emissions and use of water linked to agricultural production⁸ and a reduction in the use of chemical fumigation for pest control. Farmers can store their harvests and sell when prices are highest.

⁶ <https://starduststartupfactory.org/tigoun/>

⁷ This is based on data from tests conducted by Tigoun (<https://starduststartupfactory.org/tigoun/>) and feedback from ACF

⁸ Agriculture is responsible for 1/4 of global CO2 emissions (<https://ourworldindata.org/environmental-impacts-of-food>)

Reduction of plastic use: Tigoun bags, which have only a thin layer of plastic, use much less plastic than PP woven bags, meaning that **fewer microplastics are released into the environment.**

Recyclable paper: Paper can be easily recycled in Madagascar through several local paper recycling [businesses](#), meaning the paper layers of the Tigoun bag can be detached and recycled. ACF is exploring the possibility of being able to collect the paper layers of these bags as part of a reverse logistics project.

“The feedback from farmers who have been using these bags for two agricultural seasons is very positive. Farmers have seen a significant reduction in crop losses and can now store their harvest for resale when prices are higher to make a profit.”
 – Action Against Hunger, Madagascar





CHALLENGES

More suited to agricultural support projects rather than food distribution: While Tigoun bags are well-adapted for local storage of seeds or crops, they are less suited for food distribution programs or for applications where bags containing commodities would need to be transported long distances, as the paper is susceptible to water damage from humidity and rain.



Manufactured in France: Given that bags are produced in France, if organizations that ship food aid directly wish to use Tigoun bags, a specific supply chain /distribution channel would be required for the empty bags to be shipped from France to the organization's food suppliers, filled, and then sent to the countries of destination.

Vulnerability to humidity and mold: According to ACF's experience, the bags must be stored properly to protect the contents. They need to be placed on palettes so that they do not touch the ground, and care needs to be taken during transport as they can be easily torn. To help mitigate these risks, Tigoun provides free training sessions on how to use the bags correctly to avoid contents being affected by humidity and insects. It recently completed a four-day training with Malagasy farmers and will continue to support farmers in this way.

High cost: As is often the case with alternatives to petroleum-based packaging, a drawback of the Tigoun bags is their cost, which is 2-3 times higher than that of the woven PP bags. As a result, these bags are, for the time being, more accessible to humanitarian organizations with flexible budgets or those that have their own core funding and can choose more expensive options. ACF was able to cover the additional cost with funds from its donors because of close collaboration and dialogue outlining the benefits in terms of the reduced environmental footprint of bags and their contribution to more sustainable agricultural practices in Madagascar. However, other humanitarian actors have expressed an interest in using the Tigoun bags⁹ and it is possible that an increasing demand for the bags will help drive the price down. Humanitarian organizations also have the possibility to buy these bags directly from the supplier (not through Tigoun), which would significantly reduce the price.

 Positive aspects of Tigoun bags	Negative aspects of Tigoun bags 
Good conservation qualities leading to reduced postharvest losses and use of chemical fumigation for pest-control	Higher cost than PP bags
Reduced use of plastic and creation of microplastics	More adapted to storing crops and seeds than food distribution

⁹ As well as supplying bags to ACF, Tigoun has supplied them to GIZ, the German Development Agency

 Positive aspects of Tigoun bags	Negative aspects of Tigoun bags 
Bags are composed of 80% biodegradable and 80% renewable materials	More adapted to local than international use, as bags are more susceptible to tearing or getting wet during transport
Bags can be re-used for 3 to 5 years	Currently only manufactured in France, whereas PP woven bags are manufactured all over the world
Bags can potentially be recycled locally	
Social acceptance of bags among Malagasy farmers	
Supplied by a local company (although the bags are currently made abroad). In comparison, the PP woven bags used by ACF are procured from a supplier in India	



CONCLUSIONS

Finding an alternative to PP woven bags is complex due to their versatility, durability, strength, and low price. Nevertheless, food loss resulting from humidity and insect infestation is a recurring problem among farmers, and one which humanitarian organizations and donors need to address. Tigoun bags represent an interesting alternative to PP woven bags, due to their capacity to significantly reduce food loss and for their ecological properties.

As described above, their application of these bags to humanitarian programs at scale (by major global actors such as WFP or USAID) would require some efforts to adjust supply chain processes, and organizations would need to work with their suppliers and the manufacturer to identify solutions. The present case study provides inspiration for humanitarian organizations wishing – like ACF – to pilot the use of Tigoun bags in the context of the local storage of seeds and crops, before exploring this as an alternative to PP woven bags in other contexts.

Humanitarian organizations have a responsibility to minimize their environmental impact and ensure the effectiveness (and efficiency) of their programs, meaning that they are increasingly required to explore more environmentally sustainable solutions even if this is sometimes a long and complex process.

The role of humanitarian donors is essential in this respect. This case study shows how donors helped support a greener initiative, despite the higher costs involved. Additional costs related to the use of more environmentally friendly packaging (when packaging is required) should therefore be planned and included in budgets, and transparent and regular dialogue always maintained with donors.