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Mozambique, Animal Health
27 August 2026

Mozambique: Turning Fruit Waste into Livestock Feed to Improve Animal Health and Food Security

Abstract

Mozambique grows large amounts of tropical fruit every year — mangoes, bananas, papayas, pineapples and cashew apples — but a lot of it spoils before anyone can eat or sell it. The country simply doesn't have the storage facilities or transport infrastructure needed to get fresh fruit to consumers in time. Meanwhile, livestock farmers are fighting a different battle: keeping their cattle healthy when quality feed is expensive and almost impossible to find during the dry season.

This paper looks at whether Mozambique could solve both problems at once by turning surplus fruit into livestock feed using fermentation and silage production. Based on conservative estimates of fruit waste and cattle feed requirements, Mozambique could potentially produce around 2.38 million tons of livestock feed from excess fruit each year — enough to support more than 300,000 cattle. I propose a network of small, community-based processing centres that convert fruit waste into silage, a low-cost feed that can be stored for years. I further recommend that the idea should first be tested through one community-scale pilot before being expanded. This approach could reduce food waste, improve animal nutrition, and strengthen rural livelihoods all at the same time.

Introduction

Food security is about more than just growing enough food. It means that every person has reliable access to food that is safe, nutritious and sufficient. Yet despite the enormous amount of food produced around the world every year, one in three people still don't have reliable access to a balanced diet. One of the biggest reasons for this gap is food waste — roughly a third of all food produced globally is lost or wasted somewhere between the farm and the dinner table (HLPE, 2020).

Mozambique is a striking example of this problem. The country has a warm, tropical climate that is ideal for growing fruit, and farmers produce large quantities of mangoes, bananas, papayas and other crops each year. But much of this fruit never reaches anyone. Rural farmers lack refrigeration, processing equipment and reliable roads to market, so the fruit ripens, falls and rots on the ground.

At the same time, cattle farmers in Mozambique struggle to keep their animals in good health. Cattle typically graze on whatever vegetation is available, but during the dry season, grass and crop residues become scarce and low in nutrients. Commercial animal feed exists, but it's far too

expensive for most small-scale farmers. The result is a frustrating paradox: perfectly nutritious fruit goes to waste while cattle go hungry. This paper asks whether there is a smarter way to use that wasted fruit — specifically, by converting it into affordable, high-quality cattle feed.

Background on Mozambique and Typical Family Life

Mozambique is located in southeastern Africa along the Indian Ocean coast. With a population of around 33 million people, it is a predominantly rural country — roughly 65 to 70 percent of Mozambicans live in rural areas where agriculture is the main way families earn a living. Nearly 70 percent of the workforce is employed in farming in some way (FAO, 2022; World Bank, 2023).

Despite having a large amount of fertile land, only about 10 to 15 percent of Mozambique's farmland is actually being used. This is largely because of limited mechanization, poor road networks and a lack of investment in agriculture. Most farms are very small — typically one to two hectares, roughly the size of one or two soccer fields — and are worked by families using traditional tools and manual labour (FAO, 2022).

Mozambique's tropical climate is well-suited to growing a wide variety of fruits, including mangoes, bananas, papayas, pineapples and cashew apples. The country also grows staple crops like maize, cassava and rice. One interesting example is the cashew apple: while cashew nuts are exported in large volumes, the fleshy cashew apple that grows around the nut is almost always thrown away, even though it is highly nutritious.

A typical rural family has five to seven members. They grow crops for their own consumption and raise a small number of animals — cattle, goats or chickens — which are valuable both for food and as a form of savings. Selling livestock during emergencies is often the only financial cushion a family has. The everyday diet in rural areas usually consists of maize porridge, beans and vegetables, with meat or fish eaten only occasionally. Fruit like mangoes and bananas is available during harvest season but tends to be eaten quickly or wasted because there's no way to preserve it.

Infrastructure is one of the biggest barriers to improving life in rural Mozambique. Many communities have no paved roads, no electricity and no refrigeration. Without these basics, it is extremely difficult to store perishable food or transport it to larger markets before it spoils (World Bank, 2023).

The Challenge and Its Impact on Food Security

The scale of fruit waste in Mozambique is significant. Based on agricultural estimates, the country loses approximately the following amounts of fruit to spoilage each year: 500,000 tons of mangoes, 200,000 tons of bananas, 80,000 tons of papayas, 900,000 tons of cashew apples and 50,000 tons of pineapple waste. That adds up to roughly 1.7 million tons of fruit wasted every single year — not because the fruit isn't good, but because there's no system to preserve or transport it in time. These figures should be treated as estimates of the possible scale of the resource rather than a precise national inventory.

For livestock farmers, the consequences of poor cattle nutrition are serious. When feed quality drops during the dry season, cattle grow more slowly, produce less milk and become more vulnerable to disease (FAO, 2021). For families who depend on healthy animals as both a food source and a financial safety net, this is a real crisis. A sick or underweight cow that needs to be sold in an emergency will fetch far less money than a healthy one.

The need for preserved dry-season feed is not only theoretical. In 2025, FAO and the World Food Programme were promoting forage banks, hay and silage in Tete Province, where serious livestock losses from suspected hunger had been reported (FAO, 2025). This shows that silage is already being encouraged in Mozambique; my recommendation improves an existing approach by adding surplus fruit as a feed resource.

There is also an environmental dimension to this problem. When organic material like fruit decomposes, it releases methane — a greenhouse gas that is far more potent than carbon dioxide over the short term. Reducing fruit waste therefore has environmental benefits that go beyond the farm gate (HLPE, 2020).

Exploring Possible Solutions

There are a few ways Mozambique could try to address the fruit waste problem. The first is increasing exports. Sending fruit to international markets would generate income for farmers and reduce waste. The problem is that export markets have strict quality standards and require refrigerated transport — cold chain infrastructure that most rural farmers simply can't afford or access. Much of the fruit spoils before it even reaches an export facility.

A second option is processing fruit into products for human consumption, like juice, jam or dried fruit. This is an appealing idea, but it requires expensive equipment, food safety certification and packaging systems that are beyond the reach of most small rural communities in Mozambique.

A third option — and the one I think is most realistic and immediately beneficial — is converting surplus fruit into livestock feed through fermentation and silage production. Silage is made by chopping up fruit, mixing it with dry plant material such as maize stalks or rice husks, and sealing the mixture in an airtight pit or bag where it ferments naturally. The fermentation process preserves the nutrients and makes the feed last for one to three years without refrigeration.

The numbers make a compelling case. If one ton of fruit is mixed with dry material to create silage, the process yields approximately 1.4 tons of usable feed. Applied to Mozambique's estimated 1.7 million tons of fruit waste, this conversion rate would produce around 2.38 million tons of livestock feed per year. Given that a typical cow eats around 20 kilograms of feed per day — about 7.3 tons per year — that amount of feed could support approximately 326,000 cattle annually. These figures show the potential scale of the idea, although actual results would depend on how much usable fruit could realistically be collected.

Fruit-based silage is also surprisingly nutritious. Mangoes are high in natural sugars that boost energy. Bananas provide useful nutrients including potassium. Papayas contain the enzyme

papain and pineapples contain bromelain. The exact animal-health effect of a mixed-fruit silage would still need to be tested locally before a specific feeding rate is recommended.

Research elsewhere supports the basic concept. A 2023 study in Mexico tested silage made from 86 percent waste mango and 14 percent pangola-grass hay and found that it could be included in calf diets under tropical conditions (Cañaveral-Martínez et al., 2023). Mozambique would need its own formulation, but the comparison supports the scientific feasibility of the idea.

Recommended Solution

My recommendation is to establish community-based fruit processing centres that convert surplus fruit into livestock feed through silage fermentation. These centres would collect excess fruit from local farmers, chop it using simple shredding machines, mix it with dry crop residues and store it in sealed silage pits to ferment.

Three different scales of processing centre could be developed depending on how much fruit is available locally. A small village centre capable of processing about five tons of fruit per day could be built for approximately $30,000. This estimate breaks down as follows: land preparation ($3,000), a basic building ($10,000), fruit shredding equipment ($5,000), mixing equipment ($2,000), silage pit construction ($6,000) and basic tools ($2,000). A regional centre processing around 30 tons per day would require roughly $300,000, while a large commercial facility handling 200 tons per day could cost between $2 and $4 million.

Before trying to build a network across Mozambique, I would start with one small pilot centre in the Vilankulo–Inhassoro area of Inhambane Province. This would test the idea at community level, where the quantities of fruit collected, cost of production, quality of the silage and effect on cattle could actually be measured. If the pilot works through one or two dry seasons, the model could then be improved and copied elsewhere.

Compared to other preservation methods, silage is by far the most practical option for rural Mozambique. Fresh fruit feed spoils within two to three days. Fermented liquid feed lasts one to two weeks. Industrially produced pellet feed lasts three to five years but requires expensive drying equipment that is completely out of reach for most rural communities. Silage strikes the right balance — it requires minimal energy, uses locally available materials and stores feed for one to three years.

The economic impact could be substantial. If improved nutrition allows a cow to gain an extra 100 kilograms before sale, and beef sells for around $3 per kilogram, that's an additional $300 per animal. Multiplied across 300,000 cattle, the total additional economic value could reach around $90 million per year. That's a significant boost for communities where many families live on just a few dollars a day. This should be viewed as an estimate of possible economic potential; the pilot would provide better local evidence on actual weight gain and costs.

Making this work will require community cooperation. Fruit growers, cattle owners and a local cooperative would be the main stakeholders, while extension officers and animal-health

specialists could provide training and monitor feed quality. Government, universities or development organisations could assist with technical support and start-up funding.

The first centre would probably need outside funding for the building and equipment, while farmers could contribute fruit, crop residues or labour. Later, cooperative contributions, processing fees or surplus silage sales could help cover operating costs and reduce dependence on outside funding.

There are also limitations. Fruit is seasonal, transport can become expensive, and poor fermentation could reduce feed quality. Local training, safe fruit selection and proper sealing would therefore be essential. Starting small also lets farmers see the results before deciding whether to adopt the system more widely.

In the short term, the pilot would reduce waste and create dry-season feed. In the longer term, healthier cattle could improve production, income and resilience. If successful, the model could then be expanded to other communities. But the investment is low, the technology is simple and the benefits are immediate — which makes this a realistic solution for rural Mozambique, not just a theoretical one.

Justification for Using Fruit as Animal Feed

It's fair to ask: shouldn't this fruit be used to feed people rather than cattle? It's a good question. But the reality is that most of this fruit is already beyond the point where it can be exported or sold in consumer markets. It ripens quickly in the heat, gets damaged during handling and often reaches spoilage before it can be transported to urban centres or export facilities. Turning that fruit into livestock feed doesn't take food away from people — it recovers value from something that would otherwise be thrown away.

Using fruit waste as livestock feed also produces broad community benefits. Healthier cattle mean more meat, more milk and more income for rural families. Stronger livestock herds make communities more resilient during economic hardships. And reducing the amount of decomposing fruit reduces methane emissions, which benefits everyone. This approach strengthens the entire local food system, rather than just addressing one problem in isolation.

Conclusion

Mozambique faces two problems that most people would see as separate: too much fruit going to waste, and too little quality feed for livestock. But they are actually two sides of the same issue — a gap in the food system that leaves valuable resources unused while real needs go unmet.

Converting surplus fruit into livestock feed through silage fermentation is a practical, affordable and sustainable way to bridge that gap. It doesn't require expensive technology or large-scale infrastructure. It works with what rural communities already have. And the benefits — reduced food waste, healthier animals, stronger livelihoods and lower greenhouse gas emissions — are felt immediately at the community level.

Mozambique has the agricultural resources and the human need to make this solution work. What's needed is the willingness to connect the two. Starting with one community pilot would allow the idea to be tested, improved and proven before it is expanded. Community processing centres could then become that connection, turning one of the country's biggest agricultural challenges into one of its greatest opportunities.

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