Cassava Peels for Animal Feed

A business opportunity to promote circularity in the food supply chain

Report, May 2024

NFP

CIRCULAR ECONOMY INNOVATION PARTNERSHIP

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Project Background

Why we started the project

The Impact Case

The issue

Global food systems are one of the largest contributors to climate change and loss of biodiversity. Conversely, this means that increased sustainability of these food systems mitigates and reduces of these effects. Nigeria is the largest producer of **cassava** in the world. In 2021, 63 million tonnes of cassava was produced, while this amount is expected to increase at an annual rate of 4.28%.

Most of the production is sold through local markets or processed into products such as cassava flour. During the processing process, the **cassava peels are generally discarded as waste**. To be left to rot or burnt and as such contributing to (air) pollution and carbon emissions.

The Business Case

The opportunity

Processing these cassava peels into High-quality Cassava Peels (HQCP) through drying and milling so they can be used as **ingredients for animal feed** helps to **reduce environmental effects**, while creating **economic opportunities** by providing an alternative to currently prevalent imported ingredients for animal feed, such as maize and soy.

Moreover, through upcycling the proteins from the peels and diminishing the need for additional resources, this solution would contribute to an **optimized protein production** system.

The Project Goal

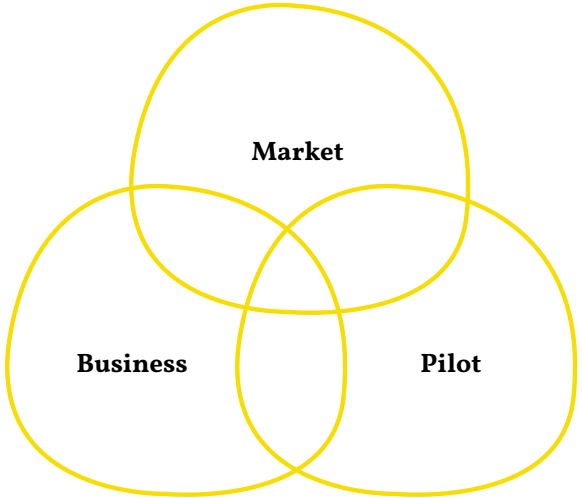
Impact the cassava supply chain

Therefore the partnership has the ambition to **explore the feasibility of a joint cassava peel processing business model** in Nigeria. To develop a scalable business model for local processing and provision of animal feed ingredients from waste streams.

This model would form a **blueprint for replication** not only for cassava processing in Nigeria, but also in other countries and with other value chains. Identifying solutions for prevalent challenges such as distributions costs, costs of valorisation, supply issues and processing capacity.

Project Brief

How might we... catalyzes the use of cassava peels for animal feed through business models

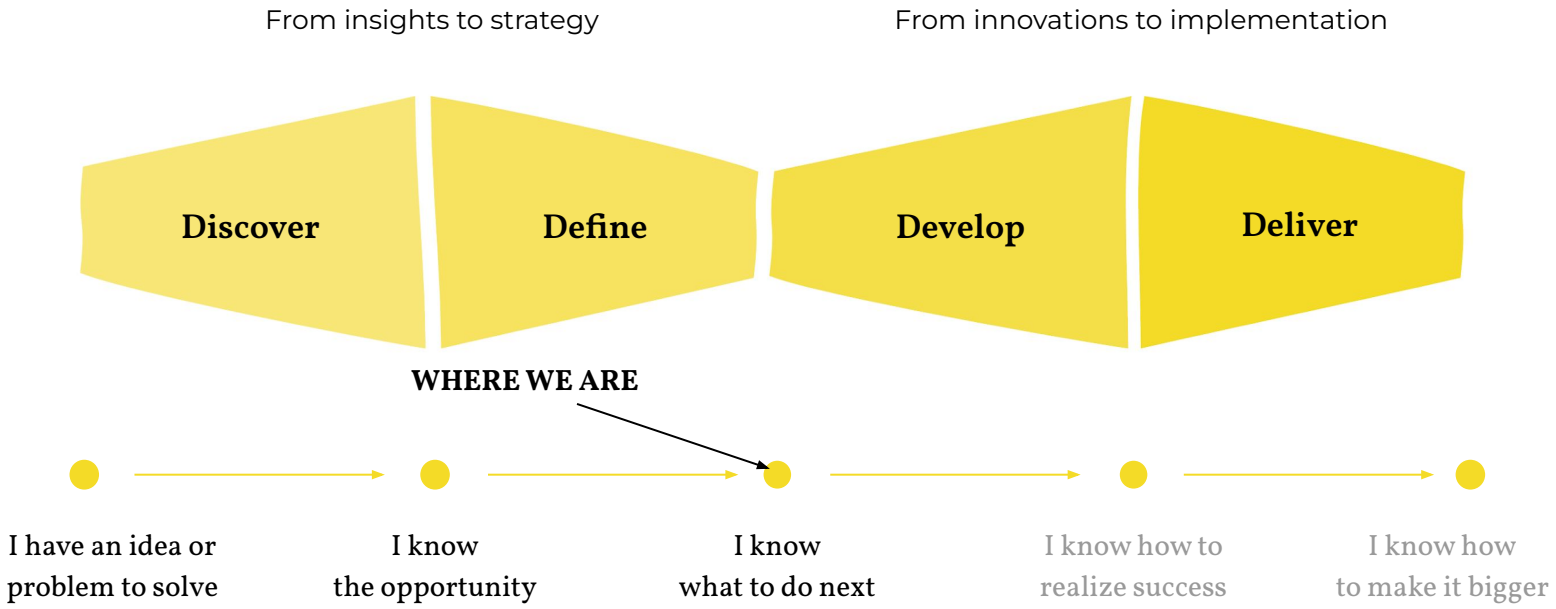


Market Potential
There is a market need for the intervention. This is what this report is about

Feasible business model
The market need can be served through a financial feasible business model

Pilot plan
A pilot to start exploiting the business model is identified

Project Status

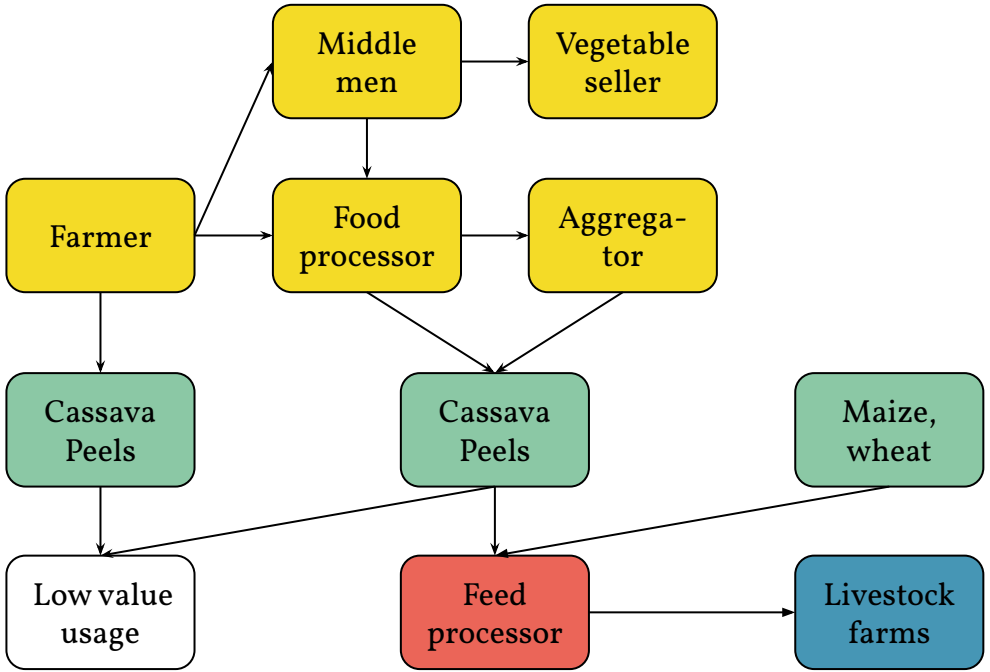


Discover

The cassava peel value chain

Supply chain landscape

The different players in the cassava peel supply chain



Key Questions

What is the current adoption of cassava peels in animal feed production?

Cassava peels have been promoted in the recent years to be applied as input material for animal feed. Have these practices already started? Are feed processors hesitant in using these? What are main blockers?

Who are currently supplying cassava peels?

Are food processors and farmers selling cassava peels already? To whom? At what rates?

Where in the supply chain are the main bottlenecks?

Where can support be applied most efficiently to catalyse the usage of cassava peels as input material for animal feed?

Findings

Cassava Peels are being utilized as raw material recently

1. All the feed processors we spoke to already use cassava peels as raw material for a variety of feed: chicken feed, fish feed, pig feed
2. This is driven by rising prices of raw materials, particularly maize and wheat. Production can be for consumption by self-owned cattle
3. Some feed producers have their own drying facilities, others source their cassava peels from middle men with a dryer
4. All cassava peels are sourced from food producers for whom this used to be waste material - they now have discovered the value
5. Sourcing enough raw materials at a good price is one of the key challenges for feed & food processors.

Findings

The feed/ food processing market is an immature market

1. Some of our original contacts were no longer operational. The ones we spoke to were generally not older than two years
2. It is a very opportunistic market. Anyone with access to raw materials and some capital can start a new feed processor. They often are started as in-house production of feed for self-owned cattle.
3. Most players are small to medium sized, employing up to 20 staff
4. Animal feed is a commodity, a margin game. The one who sources best and has the smartest feed composition can offer the best prices
5. Purchasing raw materials from local farmers is largely an informal cash business

Findings

Cassava peels are supplied by aggregators and food processors

1. All feed processors would purchase cassava peels in bulk from aggregators and food processors.
2. Aggregators also buy their input materials from food processors. They dry the cassava waste and sell it.
3. Feed processors can be set up near to a source of input material to ensure their supply chain and reduce costs.
4. New food processors consider their ‘waste’ as another revenue opportunity and actively develop a distribution chain for this.
5. Waste at the level of the farmer is not applied for animal feed production. It can be given straight to animals in the surroundings.

Findings

The costs increase of raw material presents an opportunity

1. All feed processors we interviewed experience a continuous cost increase of raw materials.
2. While initially the costs of cassava peels was next to nil, the current increase in usage is driving the price up.
3. Pricing of cassava peels is heavily influenced by their short shelf life. If a buyer has alternatives, the prices can be very low. If the seller has a steady, large supply with few alternatives, the prices are higher.
4. Currently feed processors only source raw materials from food processors (directly or indirectly) as this is the most economical way.
5. As a result, food processors are now also recognizing the potential of using this material themselves.

Opportunities

Developments

Increasing cassava price

As the price of maize and wheat is generally increasing, the need for cassava peels is increasing as well. Although the availability of cassava peels generally is widespread and hence supply theoretically far exceeds demand, the short shelf life of cassava peel waste makes it difficult for buyers to have access to a variety of sellers.

Often a supply chain is organized around a buyer, leaving the buyer and the seller both just one option.

Drying is getting cheaper

Dryers are available for as little as USD 5,000, with a capacity of dewatering 1 MT a day. Larger dryers cost around USD 25,000 (20 MT / day).

While prices fluctuate heavily, the value of 1 MT can be estimated between USD 50 - USD 100, with input material costing between USD 20 to USD 40 a day.

Local entrepreneurship

Many NIgerians are keen to improve their standard of living by taking up entrepreneurial opportunities whenever they have the chance. Younger generations are street smart and know how to navigate their way between different segments of society, being able to work with farmers as well as with business owners.

Challenges

Market Developments

A commodities market

Animal feed and input materials for animal feed are a commodity. As a result, the competition is intense. Production methods are not a strong differentiator between competitors.

The companies who can source most efficiently and establish the strongest distribution network flourishes. Establishing a new business in this space as relative outsiders is difficult.

HQCP prices are not fixed

The price of cassava peel waste is not established. It is not a regular market with a transparent pricing, unlike wheat and maize. Pricing mostly depends on the specific negotiation situation of the buyer and the seller. We have found prices between 300 to 500 naira per bag of wet cassava waste (around 30 kg).

If the buyer has alternatives, the seller will get a very low price. If the seller has no local competition and provides a steady supply of input material, prices will be substantially higher.

Only people understanding a specific local market well will be able to negotiate a good price.

Thin margins

In absolute terms, cassava waste is a low-priced commodity. While in % margins can be attractive, there is still not much space for substantial logistics or overhead costs, even when a good price is negotiated.

Wet cassava peels is a bulky material to transport, so it cannot be transported over long distances, nor can much money be spend on storage. In an unprocessed form, one is mostly transporting water and air rather than the actual nutrients.

bop inc

Define

How might we ...

Help local businesses seize the opportunity?

Types of food processors

Microprocessors (<1 MT)

This is home-production to produce garri, elubo or fufu for the local market. They may produce cassava peel waste into low-quality feed. While these activities are not scalable, the (mostly) women running such businesses are often eager to learn.

Small scale processors (1-3 MT)

Used by semi-formal businesses, producing 1 to 3 MT a day. This is the bulk of the production in Nigeria. Such processing units will generally also process cassava peel as input material. They do not apply hygienic processes and will use sun drying, which does not allow for quality control.

Medium scale processors (5-10 MT)

Formal business units producing up to 10 MT a day. They usually produce HQCP already and sell it to the informal and formal market.

This group is knowledgeable on cassava production and is interested in quality control.

Large processors (25 MT+)

Produce high-quality cassava starch for the formal industry. They will use all the cassava they source, though will often not source just cassava peels due to the high costs of logistics. Their equipment may not be suitable for processing cassava peels: one cannot use expensive fuel for drying peels as the margin is lost.

Strategic Findings

Enable local food processors to collect, dry and sell cassava peels to feed processors

We learned that:

- Feed processing and its logistics is complex and highly competitive
- The challenge is costs, logistics and processing up to the point of drying
- Local food processors are best positioned to collect and sell cassava peels. They already have the connections and logistics in place
- At the right price, there is a very strong demand. Within a few weeks, we signed 3 MoUs with potential buyers (a.o. Olam)

Strategic findings

Take away bottlenecks for local food processors can catalyze HQCP utilization

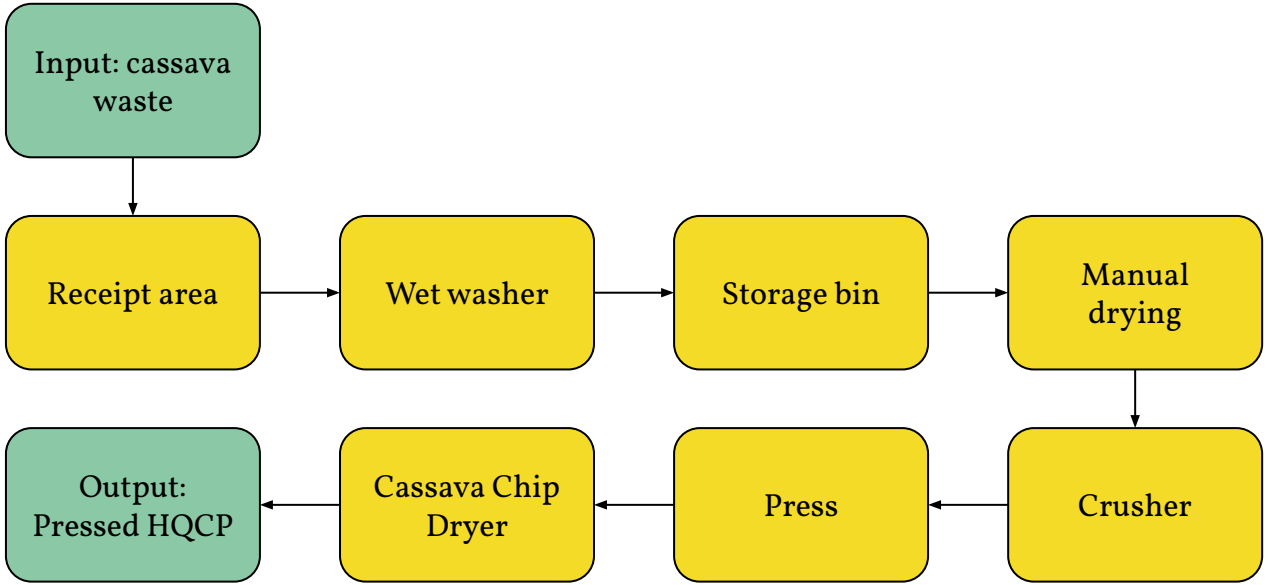
Local entrepreneurs need support:

- They do not have the technical knowhow to set up the processes
- They do not have access to capex funding
- They do not have access to non-commercial funding. Funding is through business networks & local banks

Tailored Collaborations

Producers Category	Challenges	Solution
Small - scale production	• Lack of literacy and understanding of quality processes • Working capital • Rapid deterioration of peels • Logistics	• Perform part of the process, not the entire process • Support through training • Avoid need for working capital
Medium & large scale	• Cost of drying: not feasible to use electricity or diesel • Logistics → HQCP is a low-value item • Logistics → cassava peels deteriorate rapidly	• Efficient drying technology • Partially process locally

Processing model 1: centralized processing



Processing model 1: centralized processing

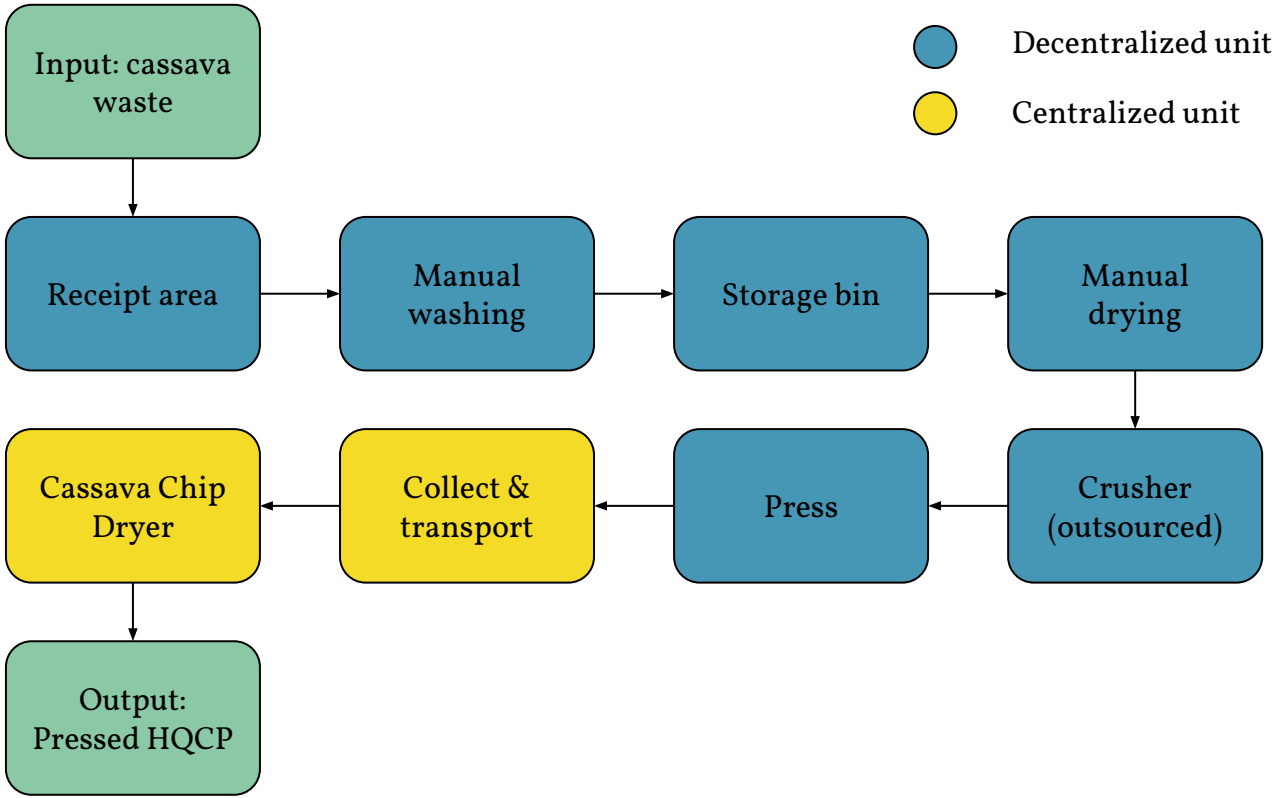
Advantages of centralized processing

1. Opex costs are low (no expensive fuel, electricity needs covered within capacity of producers)
2. Quality control is simpler as production is in-house

Disadvantages of centralized processing

1. Limited supply range (12-24 hours until cassava peels are spoiled)
2. Logistics are not optimized for longer distances

Processing model 2: decentralized processing



Processing model 2: decentralized processing

Advantages of decentralized processing

1. Opex costs are low (no expensive fuel, electricity needs covered within capacity of producers)
2. Logistics are more efficient
3. Longer supply range

Disadvantages of decentralized processing

1. Quality control is more challenging

Develop

Suggested pilots

Processing model 1: Asanita

- New food processor that will operated per Q4 2024 with capacity 25 MT cassava per day
- Currently no HQCP production capacity planned
- Willing to add a line for HQCP of 10-15 MT capacity a day
- Signed MoU with Olam for 100% offtake

Capex case centralized unit

Item	Cost
Crusher	USD 15,000
Press	USD 19,000
Dryer	USD 24.000
Infrastructure	USD 5,000
Misc	USD 7,000
Total	**USD 75,000**
Monthly depreciation	**USD 1,250**

Financial business case centralized unit

Item	Cost per MT	% of sales price
Wet cassava peel	USD 15	17.05%
Transport	USD 15	17.05%
Drying biomass fuel	USD 4.2	4.77%
Electricity	USD 4.4	5.0%
Bag	USD 1.9	2.16%
Labour	USD 3.8	4.32%
Capex	USD 1.7	1.93
Total	**USD 46.0**	52.27%
Sales price	**USD 88**	100%
Margin	**USD 42**	47.73%

Pilot activities

Most important things to begin with

1. Set up production line
2. Support in optimising production line
3. Fund through (soft) loan to show viability
4. Pilot costs : EUR 75,000 in capex, EUR 5,000 in opex

   EUR 20,000 in on-the-ground support

Potential Impact

High-level impact potential

1. Stimulating local economic activities, rural employment
2. Increasing amount of locally produced animal feed
3. Reducing emissions: reducing import (logistics), using materials that otherwise often rot
4. Building a showcase of an economically viable model

Processing model 2: Moniya & Atman

- Food processors with capacity 15-25 MT cassava per day
- Currently processing 3-5 MT HQCP / day
- Intention to increase to 15 MT HQCP capacity a day
- Use decentralised model to source additional HQCP from network
- Existing customers can ensure 100% offtake

Financial business case decentralized unit

Item	Cost per MT	% of sales price
Wet cassava peel	USD 13.3	44.44%
Crushing	USD 10.67	35.56%
Loading	USD 0.67	2.22%
Total	**USD 24.67**	82.2%
Sales price	**USD 30**	100%
Margin	**USD 5.33**	17.8%

Financial business case centralized unit

Item	Cost per MT	% of sales price
Cassava peel cake	USD 45	51.92%
Transport	USD 10	11.54%
Drying biomass fuel	USD 4.62	5.33%
Electricity	USD 4.44	5.13%
Bag	USD 1.89	2.18%
Labour	USD 2.76	3.19%
Total	**USD 68.67**	79.3%
Sales price	**USD 86.67**	100%
Margin	**USD 17.95**	20.71%

Pilot activities

Most important things to begin with

1. Set up 3 decentralised units through grant to cover initial risk
2. Support in training, optimising production line and logistics
3. Fund additional decentralised units through (soft) loan to show viability
4. Pilot costs: EUR 20,000 in Capex, EUR 5,000 in Opex and EUR 30,000 for on-the-ground support

Potential Impact

High-level impact potential

1. Stimulating local economic activities, rural employment and women entrepreneurship
2. Increasing amount of locally produced animal feed
3. Reducing emissions: reducing import (logistics), using materials that otherwise often rot
4. Building a showcase of an economically viable model

Thank you.

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