# Transforming Wet Cassava Peel into High Quality Animal Feed Ingredients

I Okike (IITA), P Kulakow (IITA), R Ofei (RTB), S Wigboldus (WUR)
Contact: Iheanacho Okike (I.Okike@cgiar.org), Scaling Champion, RTB Scaling Fund

## Abstract

Processing Africa's annual cassava roots output of 150 million tons (Mt) results in nearly 36 Mt of incremental cassava peels waste that litter the environment and pollute the air and underground water. Human population and incomes are growing faster than animal source food (ASF) supply while there is a critical shortage of high-quality animal feed and feed resources. The search for new feed resources to meet this ever-increasing demand for ASF given a fixed land base became imperative and yielded an innovative way of quickly processing the abundant wet cassava peels into safe, hygienic, energy-rich animal feed ingredients using simple machines and equipment (Figure 1). The CGIAR Program on Root Tubers and Bananas (RTB) through its Scaling Fund Project is working with IITA, the public and private sectors to scale the innovation, starting in Nigeria.

*Figure 1: Clips of dumping, pollution of the environment vs. processing wet cassava peel into high quality animal feed ingredient*

## Description of the Technology

The technology depends on induced rapid water loss from fresh peels to drastically reduce drying time from 3-4 days to 6-8 hours of sun-drying. The processing steps involving grating, dewatering, fermentation and drying (Figure 2) result in safe hydrocyanide levels while the speedy processing limits fungal contamination especially aflatoxins in products (Table 1).

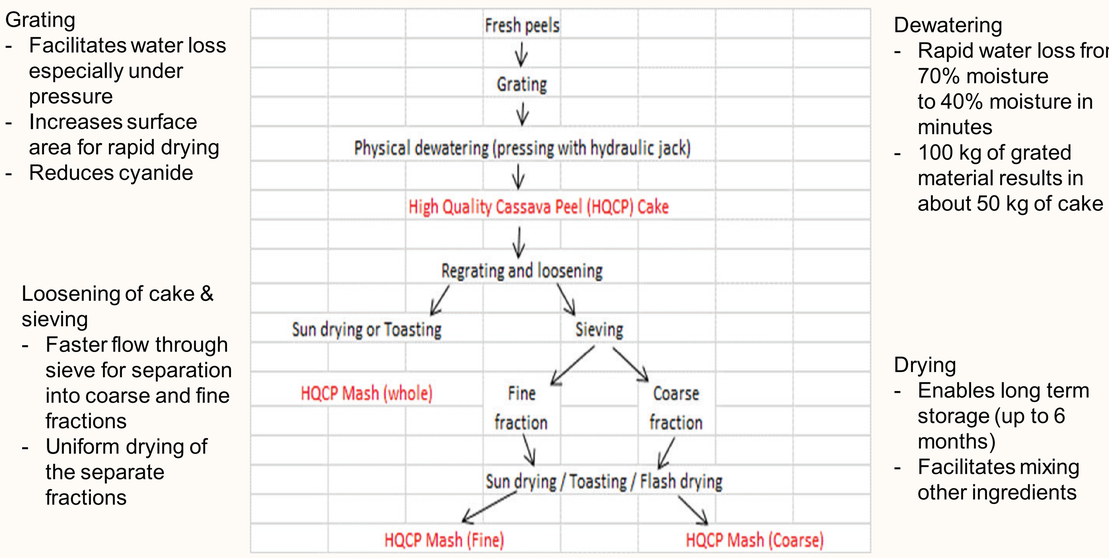


*Figure 2: Key steps in wet processing cassava peel into high quality animal feed ingredient*

**Table 1: Nutrient profiles of High Quality Cassava Peel Products (average values of paired samples from three locations)**

| | Starch (%) | Protein (%) | Fat (%) | Crude Fibre (%) | Crude Ash (%) | Total Energy (Kcal/kgDM) | Aflatoxin B1 (PPB) | Aflatoxin B2 (PPB) | Aflatoxin G1 (PPB) | Aflatoxin G2 (PPB) | Hydrocyanic acid (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Whole** | 66.7 | 2.5 | 1.4 | 9.8 | 5.8 | 2947 | 1.35 | 0 | 0 | 0 | 9 - 36 |
| **Fine** | 69.0 | 2.6 | 1.2 | 8.2 | 6.6 | 3039 | 1.35 | 0 | 0 | 0 | 9 - 36 |
| **Coarse** | 55.0 | 2.8 | 1.2 | 15.6 | 3.5 | 2495 | 1.35 | 0 | 0 | 0 | 9 - 36 |

*Analysis at Masterlab (masterlab@nutreco.com), The Netherlands and Aflatoxin analysis at IITA, Ibadan, Nigeria.*

## Problem Addressed

The innovation has potential for Africa to create new products (12 million tons of safe and hygienic feed ingredients with two-thirds the energy value of maize and worth US$1.8 billion annually); lead to a new industry in the cassava value chain (that employs 500,000 persons annually, 80% women); reduce competition between animal and human for cereals (releasing eight million tons of cereals from livestock industry); and cleaning up the environment.

New livelihoods & income, employment opportunies (pro-women & pro-youth), increased livestock productivity, clean environment, safe and storable new products! Potentially worth US$2 billion per annum for Africa

*Figure 3: The choices that we have between the current and desired situations*

## Changes Needed for Adoption and Enabling Conditions

A vision for unlocking the potential of cassava peel as a high quality animal feed ingredient was developed together with key partners from across sectors at the initial Theory of Scaling meeting showing shared ownership for the identified ways forward from the current to the wanted situation pillars (Figure 4). In between are the ways forward derived from unpacking the innovation into "hard" (red boxes) and "soft" (other colours) components both of which must be addressed to enable scaling.

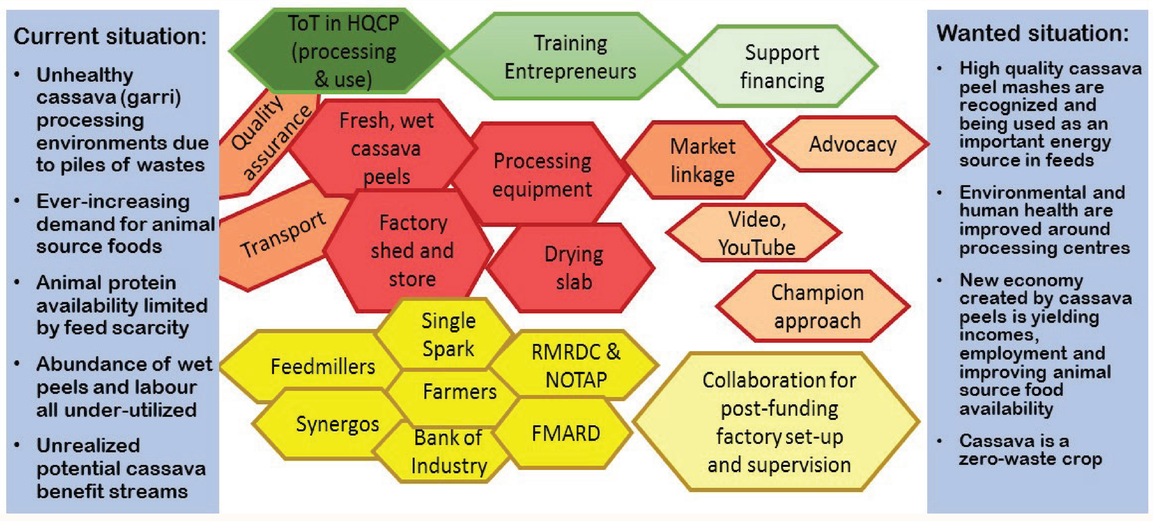


*Figure 4: Identified ways forward for scaling production and use of cassava peel products*

## Critical Activities for Scaling to Happen

- Increasing awareness among entrepreneurs of the existence of the innovation (We are using YouTube® to broadcast short (3 to 5-minute) videos of processes e.g. http://bit.ly/2j7bRu3; engaging partners that create awareness)
- Mobilizing a critical mass of adopters to kick off industry demand as feedmillers need a threshold quantity of guaranteed supply to switch formulae among feed ingredients (training interested entrepreneurs to produce safe and hygienic products that meet industry standards; facilitate emergence of aggregators)
- Overcoming age-old myth of cyanide poisoning from consuming cassava peel products (publishing and promoting nutrient profiles of the new products showing safety)
- Linking to financial/credit support services (MoU with Bank of Industry to expedite credit delivery to trained processors is in place)
- Facilitating cassava peel products commerce (Cassava Peel TrackerTM http://seedtracker.org/peeltracker/ developed for buyers' and sellers' for online trading; encouraging widespread production and use of least-cost, balanced diets incorporating cassava peel products among smallholders to boost demand using the FeedCalculator – https://play.google.com/store/apps/details?id=nl.singlespark.feedcalc&hl)
- Establishing products standards (working with Standards Organisation of Nigeria to constitute a Technical Committee for this purpose)
- Supporting industrialist with reliable technical details to enable establishment of plants (cash flow examples for various production modules available; survey to produce maps of cassava processing location as guide on peel availability to potential investors is planned)

## Partnerships

Public sector partners: to provide favourable business environment e.g. product quality assurance, policies on solid waste management, supporting awareness creation are: Federal Ministry of Agriculture and Rural Development (FMARD), Raw Materials Research and Development Council (RMRDC), National Office for Technology Acquisition and Promotion (NOTAP)

Private sector partners: See bottom strip

Research partners for product improvement and commerce:

- CIAT - improving drying efficiency
- IITA (ICT) – developing Cassava Peel Tracker® application

## Financial sustainability

- The raw material is vitually free as about 98% of peels are dumped
- Depending on drying method (sunshine, toasting, flash-drying), production costs vary from $70 to $80/t
- End-users offer half the price of maize or $100 to $150/t depending on season.
- Gross margin analysis indicates that products can reach the market with a mark-up of 30-40% on total cost of production
- Cash flow analysis for a small-scale enterprise producing 2.5T per day of cassava peel-based animal feed ingredient showed that an investment cost of US$10,000 would require a working capital of US$100/day resulting in a gross revenue of US$39,500/year, IRR 34%
- Other modules or scales of enterprise have similarly financial performance
- Primary products of this innovation are worth US$2 billion annually to Africa with potential forward linkage effects of double that amount

Private Sector Partners

SINGLE SPARK — FeedCalculator
*Efficient utilization of HQCP products in feed formulation*

BANK OF INDUSTRY
*Credit delivery, supporting training of potential investors*

Amo Byng Nig. Ltd.
*Conducting industrial level feeding trials*

SYNERGOS
*Guiding start-ups, creating awareness*

NIJI FOODS NIG LTD.
*Providing facilities for training, guiding start-ups*

CC BY