

Technical innovations in processing cassava peels into new products for feeding livestock and fish and for food safety

Iheanacho Okike, ILRI, c/o IITA, Oyo Road, PMB 5320, Ibadan, Nigeria. Cell: +234-803-667-2991. I.Okike@cgiar.org
 Michael Blummel, ILRI, c/o ICRISAT, Patancheru, India. Cell: +91-98-66-315505. M.Blummel@cgiar.org
 Claude M. Fauquet, Director GCP21, CIAT, Apdo. Aereo 6713 Cali, Colombia. Cell: +1-314-477-3973. C.Fauquet@cgiar.org
 Alan Duncan, ILRI, Addis Ababa, Ethiopia. A.Duncan@cgiar.org
 Ranajit Bandyopadhyay, IITA, Oyo Road, PMB 5320, Ibadan, Nigeria. R.Bandyopadhyay@cgiar.org
 Lawrence Kaptoge, IITA, Oyo Road, PMB 5320, Ibadan, Nigeria. Cell: +234-803-978-4487. L.Kaptoge@cgiar.org

Joseph Atehnkeng, IITA, Oyo Road, PMB 5320, Ibadan, Nigeria. J.Atehnkeng@cgiar.org
 Peter Kulakow, IITA, Oyo Road, PMB 5320, Ibadan, Nigeria. PKulakow@cgiar.org
 Anandan Samireddypalle, ILRI, c/o IITA, Oyo Road, PMB 5320, Ibadan, Nigeria. Cell: +234-903-639-1432. A.Samireddypalle@cgiar.org
 Oladoyin Ojoniyi, ILRI, c/o IITA, Oyo Road, PMB 5320, Ibadan, Nigeria. Cell: +234-803-788-4061-. ojoniyioladoyin@yahoo.com
 Bazit Bakare, ILRI, c/o IITA, Oyo Road, PMB 5320, Ibadan, Nigeria. Cell: +234-803-230-8269. bazitbakare@gmail.com
 Thierno Diallo, IITA, Oyo Road, PMB 5320, Ibadan, Nigeria. Cell: +234-803-498-3976. T.Diallo@cgiar.org



Introduction

Nigeria, the world's largest producer of cassava, harvests 54 million metric tonnes (MT) of cassava tubers annually. More than 95% of its uses require peeling which generates up to 14 million MT of waste annually of which only an insignificant amount is put to some use due especially to challenges related to drying. Sun drying is practically impossible during the wet season and takes about three days in the dry season to reduce moisture content of fresh peels from about 70% to 20% or lower - a marketable state (Fig. 1). At the same time as the mountains of cassava waste exist and create environmental hazard in the cassava producing areas of Nigeria (Fig. 2), the country's human population of over 160 million is growing at 6% annually outstripping the 3–5% growth in supply of food; especially animal source food (ASF) which is constrained majorly by feed scarcity in both quantity and quality.



Figure 1. Cassava peels after three days of sun drying (local practice).



Figure 2. Heaps of cassava peels decaying and being burnt around a garri processing center.

Materials and Methods

At ILRI Ibadan, Nigeria, a team of scientists and engineers from CIAT and IITA led by ILRI have succeeded in drastically reducing cassava peels processing time without deploying any drying equipment. The technical innovation involves grating peels (into pulp) which enables bagging and dewatering by hydraulic pressure (Fig. 3). This process removes up to 0.5 kg of moisture per kg of peel pulp; effectively eliminating up to 75% of the original moisture content within an hour. The resulting compressed cassava peel cake is loosened by grating again; with the additional benefit of attaining finer granulation. This intermediate product could be spread as is for sun drying or pelletized before spreading out. We have found that at temperatures ranging from 21–30°C and relative humidity of 60–95% drying to 12–15% moisture content is regularly achieved within six sunshine hours (Fig. 4).



Figure 3. Grating and dewatering cassava peels for sun drying (ongoing technical innovation).



Figure 4. Cassava peels mash and pellets after six hours of sun drying (ongoing technical innovation).

Potential Uses

Cassava and its byproducts are useful in livestock and aquaculture feeding programs (Lukuyu, et al., 2014). Nutritional analyses using Near-Infrared Spectroscopy (NIRS) equipment at ILRI showed the pellets to compare favourably with common grains in terms of energy content measured in MJ/kg DM e.g. peel pellets (9.4), sorghum grains (9.3), maize grains (9.7), soya-beans grains (10.9). However, the crude protein content is comparatively very low: peel pellets (39.8 g/kg DM), sorghum grains (113.6), maize grains (113.4), and soya-beans grains (534.6). At this energy content level of the pellets, cassava waste in Nigeria has the potential to cater for the energy needs of 35 million Tropical Livestock Units (TLU) annually at 10% supplementation. Products are denser than locally dried whole peels; taking less storage space and being cheaper to transport. Also compared to sorghum grains (as control) currently being used for the production of aflasafe™, the pellets have been demonstrated to support the sporulation of *A. flavus* up to 87.5% of the control (Table 1). The lower sporulation ratio (0.875:1) is, however, far outweighed by the price difference between sorghum grains and the pellets which could be in the region of 1:3 respectively. This means that higher rates of application of cassava peel pellet carrier in the field can be used to compensate for its lower sporulation, all within an overall lower cost to the farmer.

Table 1: Comparative levels of sporulation of *A. flavus* on clean sorghum seeds (normally used for aflasafe™ production – as control) and cassava peel pellets, cultured in a 24-well cell culture plate in moist chamber.

SN	Description	Initial NTU Reading			*	
		Rep 1	Rep 2	Rep 3		
1	Clean sorghum seeds (control)	275.10	356.10	272.10	* Nephelometric Turbidity Units	
2	Cassava peel pellets	197.00	246.60	289.60		
		Final NTU Reading				
		Rep 1	Rep 2	Rep 3		
1	Clean sorghum seeds (control)	23.49	35.28	24.48		
2	Cassava peel pellets	19.20	21.32	32.33		
		No. of spores/seed (millions)				Relative %
		R 1	R 2	R 3	Average	
1	Clean sorghum seeds (control)	117.3	176.2	122.2	138.6	100
2	Cassava peel pellets	95.9	106.5	161.4	121.3	87.5

Conclusion

This is very much work in progress. However, it carries a huge potential to address feed scarcity, contribute to food security and food safety, clean up the environment and improve the incomes and livelihoods of people currently engaged in processing cassava tuber into food – 85% of them women.

Reference

Lukuyu, B., Okike, I., Duncan, A., Beveridge, M. and Blummel, M. 2014. Use of cassava in livestock and aquaculture feeding programs. ILRI Discussion Paper 25. Nairobi, Kenya: International Livestock Research Institute.