International Journal of Innovation and Applied Studies
ISSN 2028-9324 Vol. 13 No. 1 Sep. 2015, pp. 78-84
© 2015 Innovative Space of Scientific Research Journals
http://www.ijias.issr-journals.org/

QUALITY OF GRANULATED CASSAVA PRODUCTS IN ISABELA AND SOUTH COTABATO, PHILIPPINES

Gigi B. Calica[1] and Joanne T. Ceynas[2]

[1]Senior Science Research Specialist,
Philippine Center for Postharvest Development and Mechanization (PHilMech),
CLSU Compound, Science City of Munoz, Nueva Ecija, 3120, Philippines

[2]Science Research Analyst,
Philippine Center for Postharvest Development and Mechanization (PHilMech),
CLSU Compound, Science City of Munoz, Nueva Ecija, 3120, Philippines

Copyright © 2015 ISSR Journals. This is an open access article distributed under the ***Creative Commons Attribution License***, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT: The study aimed to assess the quality of the granulated cassava products in Isabela and South Cotabato in the Philippines by describing the granulation practices, characterizing the granulated cassava products and the effect of the quality of granulated cassava products to the supply and income of the farmers and traders in study sites. Results showed that in Isabela practiced wet granulation while dry granulation in South Cotabato. Based on the Philippine National Standards on cassava dried chips and granules, around 40% and 50 to 67% of the granule sizes of Isabela and South Cotabato were not acceptable in the major feed manufacturing market for cassava. This resulted to low quality of cassava granules and low income for Isabela farmers and South Cotabato traders. In per hectare basis, Isabela farmers producing Class B granules received PhP1,200 and PhP1,370 lower than the Class A (good quality). In terms of volume, quality loss incurred by Isabela farmers recorded 0.80mt per hectare and 2.23mt per hectare for South Cotabato traders. Thus, appropriate granulation facility is needed by the Philippine cassava industry.

KEYWORDS: wet/dry granulation, quality loss, supply, income, appropriate facility.

1 BACKGROUND

Cassava (*Manihot esculenta Crantz*) is one of the important root crops not only in the Philippines but in the world because of its many uses. It is used in the manufacture of industrial products as well as raw material in the production of ethanol. Moreover, cassava can be processed into different food products with higher economic value [1].

In 2012, the Nigerian government [2], announced plans to substitute 10 percent of the maize in poultry feed with cassava grits, which will increase annual demand for cassava roots by 480 000 tonnes. In East Africa, the animal feed industry is turning to cassava, as maize and wheat become increasingly unaffordable [3].

In the Philippines, the major market for cassava is as feed ingredients for animals. Though Philippines is one of the major cassava producer in Asia along Thailand, Indonesia, India, China and Vietnam, demand is not fully satisfied due to low cassava production [4].

Though the cassava production in the Philippines is experiencing yearly average increase in production of 3.84 percent, still it is not enough to supply the requirement of the feed manufacturing industry. According to B-Meg a subsidiary of San Miguel Corporation [5], the major market of dried granulated cassava for feeds, they need around 500,000 MT of the product per year and the demand is still increasing. Not to mention the other companies who also require cassava for their feed manufacturing.

Corresponding Author: Gigi B. Calica

According to Bureau of Agricultural Statistics [6], around 84 percent of the total volume of cassava production had been used for processing and 88 percent of them were processed into feeds for animals.

Moreover, aside from the low production, B-Meg also encounters the problem on the quality of the granulated cassava which they bought from the traders. This is on the non-compliance on the required sizes which is 8-12mm, the moisture content at 13 percent, ash and fiber at 4 percent each of which rejections and discounted price are being faced by the farmers and traders who are engaged in the processing and granulating cassava.

Thus, the conduct of the study with the general objective of assessing the present quality of granulated cassava products in relation to the major market requirements and the income of the farmers and traders in Isabela and South Cotabato in the Philippines.

Specifically:

1. Describe the cassava granulation practices in Isabela and South Cotabato;
2. Characterize the granulated cassava products in Isabela and South Cotabato; and
3. Determine the effect of the quality of granulated cassava products to the supply and income of the farmers and traders in Isabela and South Cotabato.

2 MATERIALS AND METHODS

In the Philippines, the major producers of cassava came from the islands of Luzon and Mindanao. The case studies were conducted in Naguillan, Isabela in Luzon and Tampakan, South Cotabato in Mindanao with KU 50 and golden yellow varieties were harvested, respectively (Figure 1).

Field observations were done to capture the actual granulation practices of the study sites.

Figure 1. Map of the Philippines showing the top cassava producing areas of Isabela and South Cotabato, 2014

One kilogram of dried cassava was obtained from a batch of cassava for granulation. They were strained to four (4) different mesh screens with different diameter. Diameter of mesh screen includes 12 mm, 7 mm, 5.5 mm and 1 mm. Sample with less than 1 mm diameter was classified as fine while sample that cannot be accounted was classified as powder. Dried granules passed each diameter were weighed to determine the percentage of different size diameter of dried granulated cassava. The process was replicated to obtain an average value. Percentage weight was determined by dividing the weight of the granules for each screen mesh by one kilogram of dried granules.

The Philippine National Standard [7] on granulated cassava for feed was used to determine the quality output of the granulation processes observed. Focus group discussions and key informant interviews were conducted to gather data on the feed product classifications of the major market as well as its prices and requirements.

3 RESULTS AND DISCUSSSION

3.1 GRANULATION PRACTICES

Cassava granulation was done by the farmers in Isabela a day after harvesting. A multi-crop thresher was used in the area for granulating the wet cassava tubers. Drying of cassava granules in the pavement or roadside follows and this took around three (3) days. Frequent stirring of wet granule cassava was practiced for uniform drying. Feel method was used by the farmers in determining the moisture content of 13 percent of the cassava. Packed in polyethene bags at 50kg, farmers deliver the dried granule cassava to the cooperative which supply the B-Meg, the major market for animal feed ingredients.

On the other hand, in South Cotabato, farmers sold their cassava tubers harvest to the cooperatives, traders and assemblers. There were 16 granule processing facilities in South Cotabato [8]. Traders were the ones doing the activities from drying to granulation. Manual chipping of wet tubers with peel and without peel was done first using bolo. For a bulk of cassava tubers sold to the traders, around 70 percent were chipped unpeeled and the 30 percent were chipped peeled. Cassava peels from chipping were incorporated to the unpeeled chip cassava. Peeled chipped cassava was smaller in volume because the demand was lower than the unpeeled cassava granules.

The cassava chips were dried in a corrugated pavement for 9 days because of the bad weather condition. Ideally, drying takes 3-5 days. During the drying activities, cassava chips were covered with tarpaulin in the pavement during at night and rains. They were collected only until dried. The granulation process was done separately to both dried unpeeled and peeled cassava chips using a modified Engelberg rice mill to a granulator with a capacity of 70kg/hour. Polyethene bags were used in packing the dried granulated cassava.

In Viet Nam, cassava roots are often roughly peeled and sliced by hand before sun-drying in courtyards or along roadsides. In Thailand, many farmers take their cassava to drying yards, where the roots are first dumped into the hopper of a diesel-powered chipping machine. The chipped roots are then spread over large concrete floors for sun- drying and turned over regularly by a vehicle with a large rake. After two or three days of drying, the chips are piled up by a grader and loaded in bulk onto trucks. Some are further processed into pellets, mainly for export [1].

3.2 CHARACTERIZATION OF GRANULATED CASSAVA

The major market for cassava granules for animal feeds which is the B-Meg requires sizes of 8-12mm; moisture content at 13 percent; ash content of 4 percent and fiber content of 4 percent, the following characterization was done to determine if the present granulation practices of Isabela and South Cotabato would be in conformity with the above requirement.

Results show that in Isabela majority (51.80%) of the sample passed the requirement of the market because they had diameter greater than 7 mm but less than 12 mm. Consequently, around 28.33 percent of the sample was not acceptable because they had diameter greater than 12 mm, 11.88 percent greater than 5.5 mm 3.50 percent greater than 1 mm and 3.99% less than 1 mm (Table 1).

On the basis of the market requirement and with this characterization results, in Isabela, around 44.21 percent (comprises data of >12mm, 5.5 mm down to 1 mm) of the granulated cassava produce of the farmers would not pass the standard of the major market. The fine classification in the results could be considered for the 4 percent ash in the requirement.

Table 1. Size classification of cassava granules, Isabela, 2014

Mesh Diameter	Percentage
>12 mm	28.83
7 mm	51.80
5.5 mm	11.88
4 mm	0.00
1 mm	3.50
Fine	3.99
Powder	0.00
TOTAL	100.00

** 2 replicates*

On the other hand, in South Cotabato cassava granules has two classifications; regular/unpeeled and peeled. Results show that only 41.69 percent of the sample from unpeeled cassava had diameter greater than or equal to 7 mm but less than 12 mm. This was the only volume acceptable to the requirement of the market. All the other sizes of granulated cassava observed were not acceptable in the market. Note that the powder classification which was recorded at 1.69 percent was actually uncollected during measurement.

Peeled cassava granules that qualified to the market requirement were at 25.43 percent which had diameter less than 12 mm and greater than 7 mm. Only 0.75 percent of the samples were greater than 12mm in size while those lower that 7mm down to fine classifications were recorded at 69.78 percent. Around 4.05 percent was observed to be in powdered form which was uncollected (Table 2).

Table 2. Size classification of cassava granules, South Cotabato 2014

Mesh Diameter	Percentage	
	Unpeeled	Peeled
>12 mm	1.16	0.75
7 mm	41.69	25.43
5.5 mm	1.68	7.78
4 mm	23.54	16.79
1 mm	16.47	15.24
Fine	13.76	29.97
Powder (uncollected)	1.70	4.05
TOTAL	100.00	100.00

** 3 replicates*

3.3 QUALITY OF CASSAVA GRANULE IN RELATION TO THE INCOME OF THE SOCIETY

In the country, cassava granules were sold in two classes; A and B. The classifier of the company conducted random analysis of the delivery wherein its results would be the basis of the classification and its buying price of the delivery. Class A if the delivery conforms to the requirement of the market stated above and receives buying price at P10.50 per kg. Class B, on the other hand, is when the total delivery had less than 10 percent granule size larger than the requirement and ash and fiber content were greater than 4 percent but not more than 5 percent each. The buying price of Class B is at P10.00 per kg or P0.50 lower than Class A. However, if more than 10 percent of the total volume of the delivery contains larger cassava granules and more than 5 percent ash and fiber content, then the company imposes rejection of the delivery lot.

Consequently, with the present output of the granulation processes in the country (Tables 1 and 2) and the set requirements of the feed manufacturing, around 40.21 percent in Isabela and 50.31 percent for unpeeled 66.57 percent for peeled in South Cotabato would not be acceptable (allowable 4 percent each for the fine and fiber contents were deducted).

Considering the present marketing of cassava granules in the Philippines, quality of cassava granules greatly affects the farmers and traders' income. If in Luzon where Isabela is located, producing an average of 4.99 mt per hectare of fresh tubers, farmers could produce only 2.00 mt dried granulated cassava could have received an income of around PhP21,600 for Class A. However, not conforming with the requirement of the market and producing only Class B, income would be only at PhP20,400/ha or lower by PhP1,200/ha than the Class A income (Table 3).

Moreover, quality losses of around 0.80 mt per hectare valued at PhP8,640 for Class A or PhP8,160 for Class B were incurred by the farmers by not conforming to the standards of the market (Table 3).

Table 3. Production, granulation and drying recoveries, prices, income and quality losses incurred by cassava farmers per hectare in Isabela, Philippines, 2014

ITEM	Recoveries, %	AMOUNT
Production/ha, MT		4.99
Granulation Recovery rate, %	95.00	4.74
Dried Granulated cassava for feeds, MT	42.00	2.00
Buying price, PhP/kg		
Class A		10.80
Class B		10.20
Income, PhP/ ha		
Class A, PhP/ha		21,600
Class B, PhP/ha		20,400
Difference in income (Class A – Class B), PhP/ha		**1,200**
Quality Losses		
Sizes not acceptable, mt	40.21	0.80
Losses in income, Class A, PhP/ha		8,640
Losses in income, Class B, PhP/ha		8,160

** 1USD = PhP44.20*

In South Cotabato, Mindanao, based on the average production of 10.62 mt per hectare, income would be around PhP44,645 (peeled + unpeeled Class A), or PhP43,275 (peeled +unpeeled Class B). Producing Class B would incur the trader lower income by PhP1,370 per hectare. Not acceptable sizes in the market recorded at 2.23 mt per hectare or PhP25,115 per hectare quality loss for the trader (Table 4).

Table 4. Production, granulation and drying recoveries, prices and income of farmers per hectare in South Cotabato, Philippines, 2014

ITEM	Recoveries, %	AMOUNT
Production/ha, MT		10.62
Dried Granulated cassava for feeds, MT	40.20	4.27
Peeled	30	1.28
Unpeeled	70	3.00
Granulation Recovery rate, %		
Peeled	99.38	1.27
Unpeeled	91.48	2.74
Buying price, PhP/kg		
Peeled		12.50
Unpeeled		
Class A		*10.50*
Class B		*10.00*
Income from peeled granulated cassava		15,875
Income from unpeeled Class A, PhP/ha		28,770
Income from unpeeled Class B, PhP/ha		27,400
Difference in income (Class A – Class B), PhP/ha		**1,370**
Quality losses		
Sizes of peeled not acceptable, mt	66.57	0.85
Sizes of unpeeled not acceptable, mt	50.31	1.38
Losses in income, peeled, PhP/ha		10,625
Losses in income, Class A, unpeeled, PhP/ha		14,490
Losses in income, Class B, unpeeled, PhP/ha		13,800

** 1USD = PhP44.20*

Aside from the fact that cassava production in the Philippines was low, the above scenario shows that the industry losses around 0.80 mt and 2.23 mt of the present production in Isabela and South Cotabato, respectively. In 2013, area planted for cassava in Isabela was 3,575 hectares and 2,250 hectares in South Cotabato. Saving the stated losses above in these areas could accumulate around 7,877.5 mt.

4 CONCLUSION

Farmers in Isabela practice the wet granulation of cassava tubers using multicrop threshers while dry granulation in South Cotabato using modified Engelberg ricemill.

Based on the PNS [6], around 40 percent and 50 to 67 percent of the sizes in Isabela and South Cotabato were not acceptable in the major feed manufacturing market for cassava. This resulted to low quality of cassava granules and low income for Isabela farmers and South Cotabato traders.

In per hectare basis, Isabela farmers and South Cotabato traders producing Class B cassava granules received PhP1,200 and PhP1,370 lower than the Class A (good quality). In terms of volume, quality loss incurred by Isabela farmers recorded at 0.80 mt per hectare and 2.23 mt per hectare for South Cotabato traders.

Losses in granulation could be minimized if appropriate facilities would be available more so the quality is improved. Producing quality cassava granules would redound to higher income for the farmers and traders in the country.

ACKNOWLEDGEMENT

The authors would like to thank Ms. Karen Lingbawan and Mr. Joseph Philip Conlu who helped us gather the data, Dr. Renita SM. Dela Cruz for sharing her knowledge and PHilMech for funding the study.

REFERENCES

[1] Food and Agriculture Organization of the United Nations. 2013. Save and grow: Cassava A guide to sustainable production intensification, Rome.
[2] Government of Nigeria. Federal Ministry of Information. 2012. Federal Ministry of Agriculture launches substitution of maize with 10% cassava grits in poultry feed (http://fmi.gov.ng/)
[3] Farm Concern International. 2012. Cassava revolution turning the tables on food and income insecurity in Africa (http://www.farmconcern.org/).
[4] Department of Agriculture. 2104. Quezon City, Philippines
[5] B-Meg Philippines. 2014. Harvesting-post-harvest practices. (http://b-meg.com.ph/page/harvesting post-harvest-practices/(at- cassava-growing) download: March 10, 2014.
[6] Bureau of Agricultural Statistics (BAS). 2011. Cassava Utilization. Department of Agriculture, Quezon City, Philippines.
[7] Bureau of Agriculture and Fisheries Product Standards (BAFPS). 2010. Handbook on Philippine National Standards for Dried Cassava Chips and Granules. Department of Agriculture, Quezon City, Philippines. (http://www.bafps.da.gov.ph)
[8] Philippine Rural Development Plan (PRDP). 2014. Value chain analysis and competitiveness strategy: South Cotabato cassava chips and granules. Department of Agriculture, Region XII, Koronadal City, Philippines.

ANNEX 1. CASSAVA PRODUCTION IN THE PHILIPPINES, 2003-2013

YEAR	AREA PLANTED, HA	VOLUME OF PRODUCTION, MT	AVERAGE YIELD, MT
2003	209,213.50	1,622,241.72	7.75
2004	205,754.65	1,640,519.58	7.97
2005	204,784.13	1,677,563.82	8.19
2006	204,578.39	1,756,856.13	8.59
2007	209,632.54	1,871,137.81	8.93
2008	211,656.92	1,941,574.59	9.17
2009	215,933.28	2,043,719.41	9.46
2010	217,622.36	2,101,454.16	9.66
2011	221,235.04	2,209,684.03	9.99
2012	217,977.99	2,223,144.33	10.20
2013	217,052.16	2,361,527.54	10.88
AVERAGE	**212,312.81**	**1,949,947.56**	**9.18**

Source: Bureau of Agricultural Statistics, 2014