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Nigerian Cocoa and Cocoa By-products: Quality Parameters, Specification and the Roles of Stakeholders in Quality Maintenance

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Abstract: The Study analyses the issue of cocoa and cocoa by-products; the quality parameters and specification, the quality and quality measures adopted by farmers, Licensed Buying Agents (LBAs), warehousing operators, exporters and processors as stakeholders in Nigerian Cocoa economy; all in attempt to ensure that cocoa and cocoa by-products meet acceptable international quality standard. The study employed descriptive statistics to determine the response of stakeholders on the various quality parameters and specification of cocoa and by-products as well as the measures adopted to ensure good quality cocoa. The study revealed that quality specification of cocoa and cocoa by-products are set by different terminal or future markets as bases for acceptability at the international market and that stakeholders in cocoa play paramount, roles at ensuring good quality maintenance of the commodity.

Key words: Cocoa and cocoa by-products, quality, parameters, specification

INTRODUCTION

Cocoa (*Theobroma Cacao*) is said to have determined both the economic and political fate of many countries of the world of which Trinidad, Ghana, Cote D'Ivoire, Brazil, Costa Rica and Fernandopo are prominent. About 92% of the world's output of cocoa beans is produced in eight countries namely Cote D'Ivoire, Ghana, Indonesia, Brazil, Nigeria, Cameroon, Malaysia and Ecuador, Cocoa Producers Alliance (2002). These are countries in Africa, South America and Asia. The total world output of cocoa in 2002/2003 was 3,114,000 metric tones while the Nigeria share of the output was 165,000 metric tones, about 5.3% (Folayan, 2005). However the largest cocoa consumers in terms of products (Cake, powders and butter) are United States of America, Federal Republic of Germany, Netherlands, Brazil and United Kingdom (Folayan, 2003).

Before the discovery of Oil as foreign exchange earner in Nigeria, cocoa was the largest foreign exchange earner, even the arrival of petroleum to the central stage merely relegated the crop to the second place in the Nigeria economy. In spite of its declining contribution to Nigerian total export in the recent past; cocoa still contributes the lion share of non-oil export in Nigeria. That was why ICCO (1999) intuned that "Although its contribution to the total national export earning during the past two decades dropped considerably due to the enormity of foreign exchange earnings of crude petroleum, yet cocoa remains Nigeria's biggest agricultural export". In view of this, it is logical to submit that any mishandling of the cocoa or its by-products in terms of quality will deal a mortal blow on non-oil export in Nigeria. The need for stakeholders in cocoa therefore to ensure that their cocoa and cocoa by-products meet approved

international quality standard cannot be over-emphasized. Poor quality cocoa may lead to arbitration cases and loss of revenue apart from tarnishing the image and loss of market by the exporting countries. Assured quality standard will also forestall complaints from some overseas buyers about the quality and purity of Nigerian cocoa at the out turn.

The root causes of quality anomalies in cocoa could be traced to poor farm management, infestation and other diseases, poor handling, bad fermentation, inadequate drying and hence high moisture content, capable of making the produce vulnerable to mould and bacterial growth, poor and longtime storage, leading to fat degradation and pest infestation, without providing for fumigation and other forms of quality maintaining measures. Cocoa farmers, exporters, buying agents, warehouse operators, government agents, including produce officers at the states and federal levels and other pre-shipment inspection agents are in one way or the other collaborators in cocoa quality maintenance Folayan (2005).

Quality: Various experts have defined quality as "fitness for use" "conformitance to requirement" "freedom from variation" and so on. According to the American Society for Quality Control, Kotler (2003) also corroborated by International Standards Organization or International Organization for Standardization (ISO) founded in 1947 in Geneva at Switzerland; Oladipo (2007), quality is defined as the totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs". This is clearly a customer-oriented definition.

As quality is the basis of transaction of any commodity; quality is sought to ascertain the overall fitness of the produce for the purpose for which it is needed in cocoa and its by-products. This quality is adjudged through flavour, purity, consistency, yield, physical aspect such as bean size, percentage shell and fat content all of which influence the choice of cocoa beans can be related to the cocoa products in the sense that the physical characteristics of the beans and the flavour of the cocoa are major determinants of cocoa quality. The critical quality issues in cocoa and cocoa products market include mould, slaty, bean count, insect damaged and other defects in cocoa bean (Folayan, 1993). Free fatty acid, acid value, saponification value and unsaponifiable matter and other parameters in cocoa butter, fat content, moisture content and pH value and other parameter in cocoa cake and cocoa power and fat, fines, flavor, shell content and extraneous matter in cocoa liquor, RMRDC (1993). The quality issue may either be stated in the trade contract or in quality certifications and the benefit of certifications is usually better prices and premium prices Koekoek (2003).

MATERIALS AND METHODS

Study area: The study was carried out through Cocoa Farmers, Cocoa Licensed Buying Agents (LBAs) and cocoa warehousing quality operators in Ondo State, Cocoa exporters and cocoa processors in Ondo, Ogun and Lagos states of Nigeria.

Data sources and type: Data used for this study were collected from both primary and secondary sources. Primary data were obtained from the responses of fifty cocoa farmers, thirty five cocoa LBAs, fourteen cocoa warehousing/quality operators, twenty cocoa exporters and seven cocoa processors in the study area. The data were collected with the aid of a set of structured questionnaire. Secondary data were collected from relevant text books, published and unpublished materials, including seminar and conference papers. For reliable data to be collected, the set of questionnaire was first pre-tested and was later reviewed. Data were collected on the following information relating to cocoa and cocoa by-products, quality parameters and quality specification and roles of stakeholders at maintaining good quality.

Sampling technique: The study made use of both the random and purposive sampling technique. Cocoa farmers, Cocoa LBAs and Cocoa exporters were selected by random sampling technique from sampling frame constructed from the information provided by produce departments while quality/warehousing operators and cocoa processing industries were purposively selected. A total of 126 respondents

including 50 cocoa farmers, 35 LBAs, 20 exporters, 14 quality control and warehousing operators and 7 cocoa processing industries were selected from administered questionnaire.

Method of data analysis: The study used simple descriptive statistics of frequency distribution and percentage to analyze the data collected.

RESULTS AND DISCUSSION

Number of currently functioning Cocoa Processing Factories in Nigeria: Findings from the study revealed that the presence of cocoa and the need to add value to and enhance the quality of cocoa and its by-products in Nigeria had led to the establishment of seventeen cocoa processing industries in some part of the cocoa producing states of Nigeria between 1964 and 2006. However, of the seventeen cocoa processing factories as contained in Table 1, only seven of them are currently operating. The rest have either not been completed, closed down or did not come on board at all. The processing companies have many problems such as inadequate working capital, irregular power supply, high cost of cocoa beans, inefficient and sometimes obstructive government policies (Salami, 2000).

International standard quality parameters for cocoa and cocoa by-products: The basis upon which cocoa and its by-products are graded/analyzed according to the bean count as well as quality and standards as set by different terminals or future markets as a basis for deciding whether a particular parcel is suitable for tendering on the market at the contract price, premium or discount is stipulated by two international bodies namely Alliance Française in Commerce Dles Cocoa (AFCC) Cocoa Association of London (CAL) (Folayan, 2005). AFCC is a Trade Association based in Paris which issues contract terms used by French speaking origin of cocoa not destined to the united States of America (or Canada). The association defines various cocoa qualities and has arbitration procedure in the event of disputes contracts are subject to the law of France. CAL, Cocoa Association of London based in London. CAL contract are used by English speaking origins of cocoa not designed to the United States of America (or Canada). The Association defines various cocoa qualities and has arbitration procedures in the event of dispute between buyers and sellers. Contracts are subject to the law of England and Wales. As stipulated by CAL and AFCC contracts; there are two (2) grades of cocoa viz (I and II) with the quality parameter specification as contained in Table 2 and 3, while the quality parameter specification of cocoa by-products of butter, cake, powder and liquor are contained in Table 4, 5, 6 and 7.

Table 1: Functioning and non-functioning cocoa processing factories in Nigeria

Name of factories	Date Established	Date operation commenced	Initial Capacity	Status
Cocoa product industries Ikeja, Lagos State.	Na	1967	30,000	Operating
Ile-Oluji Cocoa mill, Ile-Oluji, Ondo State.	1981	1984	30,000	Operating
Coop. Cocoa Product currently being managed by Olam Nig. Ltd. Akure, Ondo State.	1990	1997	10,000	Operating
Cocoa product industry Nig. Ltd., Ede, Osun State.	1964	Na	30,000	Defunct
Ebun Industry Ltd, Lagos	na	Na	Na	Moribund
Stamark holdings Ltd, Ondo, Ondo State	1991	1993	10,000	Operating
Tulip Cocoa Factory Processing (formerly of Temple and Golder) Ijebu Mushin, Ogun State.	na	Na	10,000	Operating
Oregun Cocoa Mills, Lagos, Lagos State.	na	Na	10,000	Moribund
Lad Group Ltd, Isolo, Lagos State	Na	Uncompleted	30,000	Moribund
Fedma Cocoa Processing Industry Uruala, Umuahia Abia State	na	Uncompleted	na	Moribund
Romod Industry Ipoti Ekiti, Ekiti State	na	Uncompleted	na	Moribund
Idanre Processing Mill, Idanre, Ondo State	na	Uncompleted	na	Moribund
Owena Mill Akure, Ondo State	na	Na	4,000	Moribund
Carry Fast Nig Ltd, Akure, Ondo State.	na	Na	na	Moribund
Multitrex Cocoa Processing, Ibafo, Ogun State.	2005	2006	30,000	Operating
Standard Organization Cocoa Processing Industry, Akure, Ondo State	2007	2009	10,000	Operating
Agro Traders Cocoa Processing Ltd., Akure, Ondo State.	2007	Work in progress	Na	Installation work in progress

Source: Computed from Field Survey, 2008

Table 2: Cocoa beans quality parameter specification

Parameters	Main crop		Light crop	
	Grade I	Grade II	Grade I	Grade II
Total mould	3% max	4% max	3% max	4% max
Slaty beans	3% max	6% max	3% max	6% max
Other defect	3% max	8% max	3% max	8% max
Wt of 300 beans	≥310 g	≥310 g	≤310 g	≤310 g

Source: Effect of quality in Agricultural Produce Business, Folayan (1995)

Table 3: Parameter specification of fermented cocoa bean

Parameters	Good fermented	Fair fermented
Other effects	5% max	10% max
Slaty	5% max	10% max

Source: Effect of quality in Agricultural Produce Business, Folayan (1995)

Table 4: Quality specification of cocoa butter

Parameters	Specification
Free fatty acid	1.75 max
Acid value	3.5 max
Saponifiable value	188-198
Insaponifiable matter	35 max (with pe-ether)
Iodine value	35-39 (wijs method)
Refractive index	1.4565 = 1.4575 at 40°C
Melting characteristics	
(i) Incipient fusion (fusion point)	31-32°C
(ii) Slip point	32-33°C
(iii) Clear point	33-34°C

Source: Raw Materials Research and Development Council (1993)

Quality control measure adopted by cocoa stakeholders: As shown in Table 8, 100% of the Cocoa farmers in the study area indicated adequate farm management practices including weeding and use of appropriate chemicals and timely harvesting of ripped

Cocoa pods, while 86% and 72% of the respondents indicated adequate fermentation of cocoa and good storage of well dried cocoa beans as devices to ensure good quality cocoa.

Table 9 indicated that 100 per cent of the LBAs in the study area indicated education of cocoa farmers, 80% indicated outright rejection of bad quality cocoa; while 60% indicated payment of differential prices as method adopted for influencing maintenance of good quality cocoa beans through the cocoa farmers.

The result of findings in respect of quality and warehousing agents is as contained in Table 10. From the findings, 100% of cocoa warehousing/quality control operators performed quality inspection services of weighing and weight determination, quality determination, advisory services, issuance of reports and certificates and routine maintenance all in an attempt to ensure good quality cocoa. 100% of the warehousing agents, as shown in Table 11 indicated that percentage presence of mouldy beans, slaty beans, insect damaged, bean count (size) and moisture content are usually sought for as the quality parameters by international bodies.

Table 5: Quality specification of cocoa cake

Parameters	Specification
Fat content	11-13%
Moisture content	45
pH value	7% max
Ash content	<10%
Total plate count max	20,000/gm
Mould	50/gm max
Test	50/gm max
Coliform	19/gm Max
<i>E-coli</i>	Negative
<i>Semonella</i>	Negative

(I) Maximum of 75 microscopic insect fragment per 50 gm when 5,50 m samples are examined.

(ii) Max of 2 rodent hairs per 50 gm when 650 gm sub-samples are examined. Or maximum of 4 rodent hairs on any sample.

Source: Raw Materials Research and Development Council (1993)

Table 6: Quality specification of alkanised cocoa powder

Parameters	Specification
Appearance	Fine smooth powder
Colour	Reddish or sandy Brown
Odour and taste	Typical of cocoa, no flavour additive
Moisture	11-13%
pH of 10% solution	6,8 + 0.20
Sedimentation	Max 0.25 ml over 5 min in 1 ml
1 ml off glass of mesh	Max 2% above 200 175 micron sieve
Microbial quality	
Total aerobic count	Max 10,000/gm
Moulds and yeast	Max 50/gm
Coliform	Less than 10/gm
<i>E-coli</i>	Negative
<i>Somalia</i>	Negative

Source: Raw Materials Research and Development Council (1993)

Table 7: Quality specification of cocoa liquor

Parameters	Specification
Fat content	52% max
finess	2% Residue on 200 mesh sieve
Moisture content	1.5 max
pH value	5.2-5.8%
Flavour	Foreign off flavour
Shell content	Max 1.0
Free fatty acid	1.65
Total plate count	Max 5,000/gm
Coliform	Max 10/gm
<i>E-coli</i>	Negative
<i>Samolina</i>	Negative
Yeast and mould	Max 50/gm
Yeast	Max 50/gm
Extraneous matter	Negative

Source: The success story of cocoa processing and chocolate manufacture in Ghana

Table 12 showed that 100% of the cocoa exporters indicated ordering of redrying of wet cocoa beans and outright rejection of bad quality cocoa while 70% each indicated premium price for good cocoa and advanced payment for suppliers of good quality cocoa while 60% revealed that discounted prices are paid for bad quality cocoa as devices for the cocoa LBAs to improve on the quality of cocoa supplied.

All the cocoa processors, 100% indicated the use of quality control agents, purchase on seeing and buying

Table 8: Cocoa quality control measure adopted by cocoa farmers in study area

Control measure	Freq.	Percent
Adequate farm management practices	50	100
Timely harvesting of ripped cocoa pods	50	100
Adequate fermentation of cocoa beans	43	86
Adequate drying of cocoa	50	100
Good storage of well dried cocoa beans	36	72

Freq. = Frequency; Source: Computed from field survey, 2008

Table 9: Quality control measure of cocoa beans adopted by LBAs in study area

Control measure	Freq.	Percent
Payment of differential prices	21	60
Outright rejection of poor quality cocoa	28	80
Educating the cocoa farmers	35	100

Freq. = Frequency; Source: Computed from field survey, 2008

Table 10: Roles of cocoa warehousing agents in cocoa quality control in study area

Roles	Freq.	Percent
Weighing and weight determination	14	100
Quality analysis	14	100
Quality control advisory services	14	100
Issuance of quality reports and certificates	14	100
Routine warehouse maintenance	14	100

Freq. = Frequency; Source: Computed from field survey, 2008

Table 11: Quality parameters usually sought for in cocoa beans by quality inspection/warehousing agents in study area

Quantity parameters	Freq.	Percent
Mouldy beans	14	100
Slatey beans	14	100
Insect damaged	14	100
Bean count	14	100
Moisture content	14	100

Freq. = Frequency; Source: Computed from field Survey, 2008

Table 12: Cocoa quality control measure adopted by cocoa exporters in study area

Quality parameters	Freq.	Percent
Ordering redrying of wet cocoa beans	20	100
Discounted prices for poor quality cocoa	12	60
Premium price for good quality cocoa	14	70
Outright rejection of poor quality cocoa	20	100
Advance payment for suppliers of good quality cocoa	14	70

Freq. = Frequency; Source: Computed from field Survey 2008

basis, avoidance of unduly prolonged storage of by-products of cocoa and fumigation of stored cocoa against pests, routine and proper maintenance of processing machines and equipments as the quality control measure, while 85.71% of the cocoa processors adopted outright rejection of bad quality cocoa and proper storage of stock piled cocoa and 78.57% indicated premium price for good quality cocoa as quality control measures for their products (Table 13).

As shown in Table 14, 100% of the seven functioning cocoa processors indicated cocoa cake, cocoa powder

Table 13: Quality control measure adopted by cocoa processing factories in study area

Control measures	Freq.	Percent
Use of quality control agent	14	100.00
Outright rejection of bad quality cocoa	12	85.71
Premium price for good quality cocoa	11	78.57
Purchases on seeing and buying basis	14	100.00
Proper storage of stock piled cocoa bean	12	85.70
Avoidance of unduely prolonged storage of cocoa and by-products of cocoa	14	100.00
Routine and proper maintenance of processing machines and equipments	14	100.00
Fumigation of stored cocoa beans against pests and rodents	14	100.00

Freq. = Frequency; Source: Computed from field Survey, 2008

Table 14: By Products of cocoa processing factories in study area

By products	Freq.	Percent
Cocoa Butter	7	100
Cocoa Cake	7	100
Cocoa Powder	7	100
Cocoa liquor	7	100

Freq. = Frequency; Source: Computed from filed work 2008

and cocoa butter, as their cocoa by-products while only 42.80% indicated cocoa liquor as one of the by-products. They also revealed that the quality of their products are done in accordance with the laid down international standard.

Conclusion: The study revealed that cocoa, butter, cake, powder and liquor are by products of processed cocoa beans and that there are international quality standard specification set by different terminals or future markets as a basis for acceptability of cocoa and its by-products. The result of findings showed that appropriate and adequate farm management practices by cocoa farmers; education of cocoa farmers, outright rejection of quality cocoa and payment of differential prices by cocoa LBAs; Quality inspection and quality maintenance advisory services by cocoa warehousing agents; use of quality control agents and ordering of redrying of cocoa beans by exporters and avoidance of unduely prolonged storage, fumigation of stored cocoa against pests, routine and proper maintenance of processing machines and equipments by cocoa processors are devices by stakeholders to ensure good quality maintenance of cocoa and its by-products in the study area.

Recommendations: Based on the facts emanating from the findings that good quality cocoa and its by-products are premised on control measures adopted by stakeholders in the commodity; the outcome of which are better prices and premium rather than arbitration cases and discounting in the case of poor quality cocoa. It is therefore recommended that all stakeholders in cocoa and its by-products should strive hard at contributing to improve the quality at all level by embracing the culture of excellence, bearing in mind that there is no alternative to producing good quality cocoa; so as to keep reaping the benefit of exporting good quality cocoa towards sustaining good image at the international market scene.

Government should encourage policies and programmes such as adequate funding of research, improved extension services cocoa rehabilitation and financial assistance that would facilitate increased capacity utilization by processing factories and export trade. In addition the cocoa processing factories should be funded or encouraged to establish plantations directly or through the use of out-growers.

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