Standards for cassava products and guidelines for export





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Preface

At the inception of the present administration in 1999 under the leadership of the President and Commander-n-Chief of the armed forces of the Federal Republic of Nigeria, Chief Olusegun Obasanjo (GCFR), the economy of Nigeria was in a bad shape. The manufacturing sector was almost devastated and its contribution to the gross domestic product (GDP) was about 8%. This was so because the capacity utilization of our industries was below 30%. To rejuvenate the comatose industries and accelerate the rate of industrialization, the government divested its interest in public enterprises through commercialization and privatization. The main thrust of government industrial policy today is based on public/private sector partnership with the private sector taking the leading role. The government focused on providing an enabling environment through provision of adequate infrastructure. Other areas of focus include the development of social, solid mineral resources and agriculture as we can see today that the economic climate is changing for the better. This publication on Cassava products and guidelines for export aims to provide information to cassava stakeholders in support of President Olusegun Obasanjo's vision and determination to make Nigeria a major cassava producing and exporting nation. While diversifying the economy through the development of the agricultural sector, it will create opportunities for commodity export and foreign exchange earning. In effect, the cassava market will positively affect all aspects of the lives of Nigerians and satisfy the national demand for cassava as a raw material in the industrial sector.

The diversification and expansion of cassava development into new growth markets presents real opportunities for a boom in the production, processing, and supply system. In realization of these challenges and opportunities, the Standards Organisation of Nigeria (SON), in collaboration with the International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria has produced this publication on standards for cassava products and guidelines for export to facilitate the implementation of the Federal Government policy on cassava and cassava products. It is also to ensure quality, and safety, provide consumer protection, and stimulate export of cassava products in particular and agricultural produce in general. The publication gives the reader the guidelines to technical aspects of food control including evaluation of chemicals and microbial requirements, sampling, and export inspection in order to make Nigerian cassava and cassava products comparable and competitive in the international market. The effective implementation of the contents of this publication will assure the global market of the quality of cassava and cassava products from Nigeria. It is expected that the publication will help to fulfil the aspirations of Government, and the people of Nigeria, and Africa in general in meeting export requirements of cassava and cassava products.

Dr. John Ndanusa Akanya (OON)

Director General, SON

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The alliance between Standards Organization of Nigeria (SON) and IITA which materialized into this publication is greatly appreciated. IITA will continue to complement the efforts of national programs in the drive to sustainably commercialize cassava in Nigeria.

Hartmann Director General, IITA Chapter one Introduction

Standards for cassava products and guidelines for export

Introduction

Food standards can be defined as documents or rules that concern foods from raw material to finished products or retail presentation. They are an integral component of food laws.

Food standards seeks to:

- promote safety and protect consumer
- limit the sale of unwholesome products
- simplify the marketing of food products.

There is a growing awareness of the importance of quality and the need for standardization of cassava and cassava products whether they are used for domestic consumption or intended for international trade.

Traditional cassava-based foods of producer countries have not generally been standardized and their quality is very variable, although a few specifications have been suggested or adopted. Some countries, for example, Brazil, India, Malaysia, Paraguay, Thailand, and the United States have laid down official standards for various commercial cassava products including chips, flour, pellets, starch, tapioca (flakes, pearls) and tapioca spent pulp (a by-product of cassava starch manufacture). Although there are variations between standards for the different products and different countries, the main quality parameters are moisture, fiber, ash, and starch contents.

Cassava root and its allied products present real opportunities not only for income generation for the rural populace but also for diversification and expansion into new growth markets as substitutes for various imported items. These publications for cassava and cassava products therefore present issues on standardization, quality assurance procedure, and export guidelines.

What is a standard?

ISO/IEC Guide 2:1996 defines a standard as a document, established by consensus and approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context. Standards are varied in character, subject, and medium. They

- cover several disciplines: dealing with all technical, economic and social aspects of human activity and covering all basic disciplines such as language, mathematics, physics, etc.
- are coherent and consistent: standards are developed by technical committees which are coordinated by a specialized body, and ensure that they overcome barriers between different areas of activity and different trades are overcome;
- result from participation: standards reflect the results of joint work involving all competent parties concerned and are validated by consensus to represent all relevant interests: producers, users, laboratories, public authorities, consumers, etc.;
- are a living process: standards are based on actual experience and, lead to material results in practice (products, both goods and services. test methods, etc.); they establish a compromise between the state of the art and the economic constraints of the time;
- are up to date: standards are reviewed periodically or as dictated by circumstance to ensure their currency, and therefore evolve together with technological and social progress;
- have a reference status: in commercial contracts and in court in the event of a dispute;
- have national or international recognition: standards are documents which are recognized as valid nationally, regionally or internationally, as appropriate;
- are available to everyone: standards may be consulted and purchased without restriction.

As a general rule, standards are not mandatory, but are for voluntary application. In certain cases, implementation may be obligatory (such as in fields connected with safety, electrical installations, in relation to public contracts, etc.).

The role of standards

A standard represents a level of know-how and technology, which renders the presence of industry in its preparation indispensable. A standard is never neutral. It is a reference document used in particular in the context of public contracts or in that of international trade and on which the majority of commercial contracts rely. Industrialists use it as the indisputable reference, simplifying and clarifying the contractual relations between economic partners. It is a document that is being used more and ntore by jurisprudence.

To the economic players, the standard is:

- a factor for rationalization of production: the standard makes it possible to master the technical characteristics, to satisfy the customer, to validate the manufacturing methods, to increase productivity and gives operators and installation technicians a feeling of security;
- a factor for clarification of transactions: faced with abundant product or service offers which may have extremely different practical values, the existence of systems of reference enables one to better assess the offers and to reduce uncertainties, to aid in the definition of the needs, to optimize supplier relations, and to do without additional testing;
- a factor for innovating and developing products: participation in standardization work enables one to anticipate and plan product progression, and enhance innovation and transfer of knowledge
- a factor for transfer of new technologies: standardization facilitates and accelerates the transferral of technologies in fields which are essential for both companies and individuals (new materials, information systems, biotechnology, electronics, computer-integrated manufacturing (CIM), etc.);
- a factor for strategic choice for companies: to participate in standardization signifies introducing solutions adapted to the competence of one's company and equipping oneself to compete within competitive economic environments: It signifies acting on standardization, not enduring it.

Types of standards

Generally, standards fall into six major categories or types namely:

- Glossaries or definitions of terminology standards
- Dimensional standards
- Performance standards
- · Test methods and analysis standards which measure characteristics
- Codes of practice
- Measurement standards.

Standards are drawn up at international, regional, and national levels.

At national level, technical committees can obtain assistance from groups of experts to conduct the standardization work. These committees or working groups are made up of qualified representatives of the industrial circles, research institutes, public authorities, consumer or professional bodies.

At regional or international level, the standardization work is conducted by technical committees, drawn from the national standards bodies. All national members are entitled to be represented within the international or regional committee dealing with a specific subject matter. Examples of the regional bodies include, among others, the African Regional Standardization Organisation (ARSO), European Union (EU), and Southern Africa Development Commission (SADC).

International standardization

International Organization for Standardization

The International Organization for Standardization (ISO) coordinates international standardization. This body was founded in 1947. It is a worldwide federation of national standards bodies, currently comprising some 145 members, one per country. The mission of ISO is to encourage the development of standardization and related activities in the world in order to facilitate international exchanges of goods and services and to achieve a mutual entity in the intellectual, scientific, technical, and economic fields. Its work concerns all the fields of standardization, except electrical and electronic engineering standards, which fall within the scope of the International Electrotechnical Commission (IEC). Elaboration of standards at ISO is handled by over 2900 technical groups (technical committees, subcommittees, working groups, and ad hoc groups). To date, ISO has published over 13 700 International Standards.

Codex Alimentarius Commission

The commission is responsible for implementation of the joint FAO/ WHO food standards programme, the purpose of which is to protect the health of consumers and ensure fair practices in food trade. SON is also a member of Codex Alimentarius Commission and adopts/adapts the recommendations of this body to Nigerian conditions in the formulation of food standards.

National standards

National standards are those formulated by the national standards body of a particular country. In Nigeria, the Standards Organization of Nigeria is the statutory body for formulation of all standards including food and food related products. It was established through Act 56 of 1971 with subsequent amendments in 1976, 1984, and 1990.

The 1984 amendment to the original Act changed the name of the body from the Nigerian Standards Organization (NSO) to the Standards Organization of Nigeria (SON) because the acronym, NSO, created confusion with a newly established security body known as the Nigerian Security Organization. In 1990, the amendment of the Act conferred partial autonomy to the SON from the Ministry of Industry.

The original Act provided the body with the authority to specify and elaborate standards, as well as provide a quality assurance system for commodities, including manufactured, industrial and imported products and services. But the 1976 amendment to the Act conferred on the Minister of Industry the power to declare Mandatory Industrial Standards in respect of products or processes recommended by the Nigerian Standards Council. Statutory functions of the SON are as follows:

- a. investigate the quality of facilities, materials, and products in Nigeria, and establish a quality assurance system, including certification of factories, products, and laboratories.
- ensure reference standards for calibration and verification of measures and measuring instruments.
- c. compile an inventory of products requiring standardization.
- d. foster interest in the recommendation and maintenance of acceptable standards by industry and the general public.
- e. develop methods for testing materials, supplies, and equip ment, including items purchased for use by State and Federal departments and private establishments.
- f. register and regulate standard marks and specifications.
- g. undertake preparation and distribution of standard samples.
- h. establish and maintain laboratories or other institutions, as may be necessary for the performance of its functions.
- i. advise State and Federal departments of Government on specific problems relating to standards.
- j. sponsor appropriate national and international conferences.
- undertake research as may be necessary for the performance of its functions.
- 1. use research facilities, whether public or private, according to terms and conditions agreed upon between the organization and the institutions concerned.

The organization has power to seize, destroy, or prohibit any person from selling or offering for sale any product with quality, purity, or potency that is detrimental or hazardous to life and property.

The standards are also reviewed periodically to reflect modern trends in technology and changing patterns of raw materials used in production. Having established the standards and regulations, the benefits of standardization can only be derived through their implementations that require monitoring by food inspectors to ascertain that the necessary quality control measures are in place in each of the food processing industries.

SON carries out the registration of both locally manufactured and imported products. The registration program is primarily designed to provide data or inventory of products and their specified quality parameters.

Nigerian Industrial Standards

The Nigerian Industrial Standards (NIS) is a precise and authoritative document established by consensus and approved by the Nigerian Standards Council prescribing necessary criteria to ensure that a material, product or procedure is fit for the purpose for which it is intended. The experts work in an honorary capacity and evolve Nigerian industrial Standards (NIS) by consensus based on scientific and technical data. SON acts as the Secretariat for the committees that are involved in the development of national standards. The Organization provides technical advice to industries on quality management and quality systems to facilitate efficient implementation of standards.

Other regulatory bodies

The National Agency for Food and Drugs Administration and Control (NAFDAC)

The National Agency for Food and Drug Administration and Control (NAFDAC) established by Act No. 15 of 1993 is to protect, promote, and guarantee public health through effective control and regulation of the business of manufacture, importation, distribution, sale and advertisement of drugs, foods, cosmetics, and medical devices. In essence, NAFDAC is entrusted with the duty and obligation to ensure quality and safety of all drugs and foods available in Nigeria. Other specific regulations by the body include:

- determining what constitutes the adulteration of any food or drug.
- prescribing the type and level of food additives or contaminants that may be present in any food offered for sale with respect to labeling and packaging and offering or exposure in any manner, for sales of any food, drug, cosmetic or device, the specifications and fill of packages of food, drugs, cosmetics and devices, and the sale of any food, drug, cosmetics or device.
- preventing injury to the health of consumers or users with respect to the use of any substance as an ingredient in any food, drug, cosmetic or device, for the purpose thereof.
- prescribing standards of composition, potency, purity or quality or of any other property, for any article of food, drug, cosmetic or

device with respect to the importation of any food, drug, cosmetic or device and with respect to the method of preparing, manufacturing, preserving, packaging, storing or testing of any food, drug, cosmetic or device in the interest of, or for the prevention of injury to the health of, consumers or users thereof, etc.

A product is registered with NAFDAC after a satisfactory assessment and evaluation of the Good Manufacturing Practice (GMP) of the manufacturer and applicable standards and specifications of the product. The Inspectorate Directorate of NAFDAC ensures that the GMP capability of the licensed manufacturer is sustained through routine establishment inspection, import inspections, market surveys, and sampling. NAFDAC laboratories at Oshodi, Yaba, Kaduna, and Maiduguri provide the technical and scientific support for the evaluation of the quality, safety, and efficacy of the products.

NAFDAC enabling acts also ensure that promotions and advertisements comply with applicable laws and regulations and that advertisement messages are reliable, accurate, truthful, non-misleading, informative, balanced, up-to-date, and capable of substantiation and in good taste. In addition, advertisement should not take undue advantage of customer's concerns for their health while at the same time, promoting rational use of these products. In other words the advertisement should not have the potential of endangering public health. NAFDAC's mandate also includes protection and promotion of public health.

The weights and measures department

This is a department under the Federal Ministry of Commerce. The Weights and Measures Act was to ensure uniformity of weights and measures, ensure fair practice in trade, and control the manner of presentation of certain pre-packed goods to the public. The Department deals mainly with measurement of length, weight, volumes, and verifying weighing and measuring equipment for trade. The Act empowers the Department to prosecute any person or manufacturer that imports, produces, sells, or uses unjust weight, measure, weighing instruments, or measuring instruments in trade.

Chapter two Nigerian industrial standards for cassava and cassava products

NIS 459: 2004–Standard for cassava roots

1. Scope

This standard specifies the quality requirements, classification, and packaging for cassava roots.

2. Normative reference

Report of the National Committee on Cassava, 2003 Raw Material Research and Development Council (Technical Information on crop production in Nigeria 1994) Codex Alimentarius Commission (CAC/RCP 1 – 1969, Rev/ 2 – 1985, Vol. 1B).

Codex Alimentarius Commission (CAC/RS/100 - 1978)

3. Terminology

For the purpose of this standard, the following definition shall apply:

Cassava roots

The roots from varieties of cassava [Manihot esculenta (Crantz)] of the Euphorbiacea family to be supplied in fresh form to the consumer, after cleaning and packaging

4. Quality requirements

4.1 Essential requirements

In all grades, subject to the special provisions for each grade and the tolerances allowed, the cassava root shall be:

- about 300 g and above in weight and not less than 20 cm in length

- whole
- firm
- wholesome, not affected by rot, mold, or deterioration
- practically free of mechanical damage and bruising
- practically free of pests
- free of abnormal external moisture
- free of any foreign smell and/or taste

Parameter	Percentage		
Moisture	70.24		
Starch	21.45		
Sugar	5.13		
Protein	1.12		
Fats	0.41		
Fiber	1.11		
Ash	0.54		

Table 1: Average composition of the cassava root.

4.2 Characteristic of the color

In addition to fulfilling the above requirement, cassava roots must conform to Table 1.

4.3 Classification and quality grades

Cassava roots are graded in three categories as follows:

4.3.1 Extra grade

Cassava in this grade must be of superior quality. It must be characteristic of the variety and must be uniform in shape, quality, and size. It also must be free of defects, with the exception of very slight superficial defects.

4.3.2 Grade 1

Cassava in this grade must be of good quality. It must be characteristic of the variety. The following slight defects, however, may be allowed, provided these do not affect the general appearance of the produce, the quality, the keeping quality, and presentation of cassava root

- slight defects in shape
- bruising, not exceeding 10% of the surface area
- scraped areas, not exceeding 20% of the surface area

4.3.3 Grade 2

This grade includes cassava, which does not qualify for inclusion in the higher grades, but satisfies the minimum requirements specified in clause

4.3.4 Permissible defects may be allowed

slight defects in shape

- · bruising, not exceeding 20% of the surface area
- scraped areas, not exceeding 30% of the surface area

5. Quality tolerances

5.1 Extra grade

Five percent by weight of cassava not satisfying the requirements of the grade, but meeting those of grade 1 or exceptionally, coming within the tolerance of that grade.

5.2 Grade 1

Ten percent by number or weight of cassava not satisfying the requirements of the grade, but meeting those of grade II or, exceptionally, coming with the tolerances of that grade.

5.3 Grade 2

Ten percent by number or weight of cassava satisfying neither the requirements of the grade nor the minimum requirements, with the exception of produce affected by rotting or any other deterioration rendering it unfit for consumption.

6. Sizing

6.1 Size is determined by the diameter at the thick cross-section of the produce, in accordance with the following Table 2.

6.2 Size tolerances

For all grades, 10% by number of weight of cassava corresponding to the size immediately above or below that indicated on the package.

Size code	Diameter(cm)
A	4.0-6.0
В	6.1-8.0
С	> 8.0

Table 2. Size of produce in diameter.

7. Packaging

Cassava root shall be packed

- in such a way to protect the produce properly from mechanical, heat, and frost damage.
- in containers, which will safeguard the hygienic, and nutritional quality of the product.
- with containers made from packaging material that will not impart any toxic substance and smell to the product.

8. Labelling

The package/container shall be marked with the following:

8.1 Name of the product (cassava root)

The name of the product to be shown on the label shall be "cassava root".

The name and location address of the exporter and/or packer shall be declared.

Country of origin of the produce and optionally, name of town.

8.2 Commercial identification shall be declared.

Grade Size (size code) Net weight (in metric system) Batch number Official inspection mark

9. Contaminants

9.1 Heavy metals

Cassava root shall comply with the requirement of the National Agency for Food and Drugs Administration and Control (NAFDAC) or with those maximum levels recommended by the Codex Alimentarius Commission for this commodity.

9.2 Pesticide residues

Cassava root shall comply with those maximum residue limits recommended by NAFDAC or Codex Alimentarius Commission (CAC/RS. /100 - 1978).

10. Hygiene

It is recommended that the produce covered by the provisions of this standard be prepared and handled in accordance with the International Code of Hygienic Practice (CAC/RCP-1-1969, Rec. 3-1997).

When tested by appropriate methods and principles for the establishment and application of microbiological criteria for Food Products (CAC/GL 21-1997), it:

- shall be free from pathogenic microorganism
- shall be free from toxic substances originating from microorganisms in amount, which may present hazard to health
- shall not contain any poisonous or extraneous and deleterious matter

11. Criteria for conformity

A lot shall be declared as conforming to this standard if each sample inspected/analysed for quality requirement conforms to the provision of this standard.

NIS 343: 2004 - Standards for cassava chips

1. Scope

This standard prescribes the quality requirement, method of sampling, and tests for cassava chips.

2. Normative references

- i. NIS 459: 2004-Standard for cassava root
- Report of the National Committee on Cassava, 2003
 Raw Material Research and Development Council (Technical Information on Crop) Production in Nigeria 1994.
- iii Codex Alimentarius Commission CAC/RCP 1 1969, Rev; 2 – 1985. Vol 1B
- iv Codex Alimentarius Commission CAC/RS /100 1978

3. Preparation

Cassava chips shall be prepared from clean, fresh cassava (Manihot esculenta Crantz) by washing, peeling, chipping, and drying.

4. Essential composition and quality factors

4.1 Raw materials

The cassava root from which the cassava chips is prepared shall be peeled, washed, cleaned, and in good physical condition.

4.2 Organoleptic properties

The taste and odor of cassava chips shall be characteristic of the variety.

4.3 Food additives

No food additives shall be added to cassava chips.

4.4 Analytical characteristics

Cassava chip shall conform to the quality requirements given in Table 3

Parameters	Requirement	Method of test (Ref.) Standard for food grade cassava starch
Moisture % (m/m) (max)	10.0	Appendix A
Ash % (m/m) (max)	3.0	Appendix D
Crude Fiber % m/m (max)	3.0	Appendix E
Total acidity % (m/m) (max) Hydrocyanic acid and its glucoside mea-	1.0	Appendix B
sured as hydrocyanic acid mg/kg (max)	10	Appendix F
Starch content (%) (min)	75	Appendix C

Table 3: Requirements for cassava chips.

5. Hygiene

- 5.1 It is recommended that the product shall be processed and packaged in accordance with the regulations for food hygiene recommended by NAFDAC.
- 5.2 To the extent possible in good manufacturing practice, the product shall be free from objectionable matter.
- 5.3 When tested by appropriate methods of sampling and examination, the products shall not contain any substance originating from microorganisms in amounts, which may present hazard to health.
- 5.4 When tested by appropriate methods of sampling and examination, the product:
- shall be totally free from pathogenic microorganisms;
- total aerobic count shall not exceed 10,000(CFU)/g
- shall not contain any other poisonous extraneous or deleterious substances in amounts, which may present hazard to health.

6. Contaminants

6.1 Pesticide residue

In addition to the provisions of CODEX and NAFDAC regulations regarding pesticide residue, the limits in Table 4 shall apply.

Maximum level	Residue (mg/kg)		
Pirimiphos methyl	0.10		
Malathion	0.10		
Hydrogen cyanide	0.05		
Permethrin	2.0		
Deltamethrin	2.0		
Dichlorvos	2.0		
Fenitrothion	10.0		
Chlorpyrifus	10.0		
Bromoethane	5.0		
Hydrogen phosphide (Phosphine)	0.1		
Carbofuran	0.2		

Table 4: Maximum residue limits for pesticides.

Table 5: Maximum limits for metallic contaminants.

Contaminants	Maximum level (mg/kg)				
Arsenic	0.1				
Copper	20.0				
Lead	1.0				
Mercury	0.1				
Tin	15.0				
Zinc	50.0				
Iron	22.0				

6.2 Metallic contaminants

Metallic contaminants limits shall be in conformity with Table 5.

7. Packaging, labelling, and storage

7.1 Packaging

Cassava chips shall be packed, transported, and stored in containers, which will safeguard the hygienic and organoleptic qualities of the product. The packaging materials shall be such as to protect the product from microorganisms and other contaminant. It shall protect the product as far as possible against any infiltration of moisture, insect infestation, and leakage.

The packaging material shall not impart any odour, taste or colour and any other extraneous property to the product and shall not result in contamination of the product with substances of which the packaging material is made.

7.2 Labelling

The packaging shall be sealed and marked with the following:

7.2.1 Name of the product

The name of the product shall be clearly and boldly written on the container.

7.2.2 Net weight

Net weight shall be declared in metric system.

7.2.3 Name and address

The name and address of manufacturer and/or packer shall be declared.

7.2.4 Country of origin

The country of origin of the product shall be declared.

7.2.5 Date marking

The date of manufacture or packing shall be declared. The expired or best before date shall be boldly written on the label.

7.2.6 Batch number

The batch number of the product shall be clearly stated on the label.

7.2.7 The NIS certification mark, if the product is certified.

7.3 Storage

Cassava chips shall be stored in a dry cool place on pallets.

8. Methods of sampling and analysis

The method of sampling and analyses shall be in accordance with the methods prescribed below:

- determination of granularity: according to ISO: 2591–1973 "test sieving"
- determination of moisture content: see appendix A
- determination of total acidity: see appendix B
- determination of starch content: see appendix C
- determination of fiber content: see appendix D
- determination of sulphated ash: see appendix E
- · determination of hydrocyanic acid content: see appendix F

9. Criteria for conformity

A lot shall be declared as conforming to this standard if each sample inspected/analyzed conforms to provision of this standard.

NIS 344: 2004 - Standard for edible cassava flour

1. Scope

This standard prescribes the quality requirements, and method of tests for edible cassava flour.

2. Normative reference

Report of the National Committee on Cassava, 2003 Raw Material Research and Development Council (Technical Information on Crop Production in Nigeria – 1994 Codex Alimentarius Commission (CAC/RCP 1 – 1969, Rev. 2 – 1985, Vol. 1B

Codex Alimentarius Commission (CAC/RS. /100 - 1978)

3. Product definition

Cassava (*Manihot esculenta* Crantz) flour shall be the product prepared from dried chips or paste by pounding, grinding, or milling process followed by sifting to separate the fiber from the flour. In case of edible flour prepared from bitter cassava (*Manihot utilisima* Pohl), detoxification is carried out by soaking the peeled roots in water for a few days before undergoing drying in the form of whole, pounded root (paste) or in small pieces.

4. Classification

Cassava flour is classified into two categories as follows:

a. "Fine" cassava flour

Cassava flour of which not less than 90 percent by weight, shall pass easily through a sieve of 0.2 mm aperture size (use mesh size).

b. "Coarse" cassava flour

Cassava flour of which not less than 90 percent by weight shall easily pass through a sieve of 0.4 mm aperture size.

5. Essential composition and quality factors

5.1 Raw materials

The raw cassava roots from which the cassava flour is milled shall be peeled, washed, dried clean, and in good physical condition.

5.2 Organoleptic properties

The color, taste, and odor of cassava flour shall be characteristic of the product.

5.3 Cassava flour shall be free from adulterants and insect infestation.

5.4 Food additives

Edible cassava flour may be fortified with micronutrient or macronutrients.

5.5 Solubility test

Cassava flour shall not be soluble in cold water and in 96% ethanol.

5.6 lodine test

Edible cassava flour when tested with iodine solution shall give a blueblack coloration.

5.7 Analytical characteristics

Cassava flour shall conform to the quality requirements given in Table 6.

Hygiene

Parameter	Requirement	Method of test (Ref.) Standard for food grade cassava starch
Moisture % (m/m) (max)	10.0	Appendix A
Crude fiber % (m/m) Max	2.0	Appendix D
Sulphated ash m/m (on dry basis) (max)	0.6	Appendix E
Total acidity % (m/m) (max)	1.0	Appendix B
Hydrocyanic acid and its gluco- sides measured as hydrocyanic		
acid mg/kg (on dry basis) (max)	10	Appendix F
Starch content (%)(min)	65-70	Appendix C

Table 6: Quality requirements for cassava flour.

- 6.1 It is recommended that the product be processed and packaged in accordance with the regulations for food hygiene recommended by NAFDAC.
- 6.2 To the extent possible in good manufacturing practice, the product shall be free from objectionable matter
- 6.3 When tested by appropriate methods of sampling and examination, the products shall not contain any substance originating from microorganisms in amounts, which may present hazard to health, e.g., aflatoxin.
- 6.4 When tested by appropriate methods of sampling and examination, the product:
- · shall be totally free from pathogenic microorganisms
- total aerobic count shall not exceed 10 000 (CFU)/g or mL
- shall not contain any other poisonous or extraneous or deleterious substances in amount, which may represent a hazard to health.

7. Contaminants

7.1 Pesticide residue

Pesticide residue limits shall be in conformity with Table 7.

Residue	Maximum level (mg/kg)				
Pirimiphos methyl	0.10				
Malathion	0.10				
Hydrogen cyanide	0.05				
Permethrin	2.0				
Deltamethrin	2.0				
Dichlorvos	2.0				
Fenitrothion	10.0				
Chlorpyrifus	10.0				
Bromoethane	5.0				
Hydrogen phosphide (Phosphine)	0.1				
Carbofuran	0.1				

Table 7. Maximum residue limits for pesticides.

Contaminant	Maximum level (mg/kg)				
Arsenic	0.1				
Copper	20.0				
Lead	0.1				
Cadmium	0.1				
Mercury	0.1				
Tin	15.0				
Zinc	50.0				
Iron	22.0				

Table 8: Maximum limits for metallic contaminants.

7.2 Metallic contaminants

Metallic contaminants shall be in conformity with Table 8.

7.3 When tested by appropriate methods of sampling and examination the product shall be free from microorganisms or its spores capable of developing under normal conditions of storage and shall not contain any substances of microbial origin in amounts, which may present a hazard to the health of the consumer.

8. Packaging, labelling, and storage

- 8.1 Edible cassava flour shall be packed, transported and stored in containers, which will safeguard the hygienic and organoleptic qualities of the product.
- 8.1.1 The packaging materials shall be such as to protect the product against bacteria and other contaminant; it shall protect the product as far as possible against any infiltration of moisture, insect infestation and leakage.
- 8.1.2 The packaging material shall not impart any odor, taste, or color and any other extraneous property to the product and shall not result in contamination of the product with substances of which the packaging material is made.

8.2 Labelling

The packaging shall be sealed and marked with the following:

8.2.1 Name of the product

The name of the product shall be clearly and boldly written on the container.

8.2.2 Net weight

Net weight shall be declared in metric system.

8.2.3 Name and address.

The name and address of the manufacturer and /or packer shall be declared.

8.2.4 Country of origin

The country of origin of the product shall be declared.

8.2.5 Lot identification

Each container shall be permanently marked in code or in clear to identify the producing factory and the lot.

8.2.6 Batch number

The batch number of the product shall be clearly stated on the label.

8.2.7 Date marking

The date of manufacture or packing shall be declared. The expired or best before date shall be boldly written on the label.

8.2.8 The NIS Certification Mark if the manufacturer is a licensee.

8.3 Storage

Cassava flour shall be stored in a dry, cool place on pallets.

9. Method of analyses

The method of analyses shall be in accordance with the methods prescribed in section 10 of Standard for starch NIS 386: 2004

10. Criteria for conformity

A lot shall be declared as conforming to this Standard if each sample inspected/analysed conforms to all provision of this Standard.

NIS 294: 2004 - Standard for composite flour

1. Scope

This standard specified the essential quality requirements and sampling methods for composite flour and other suitable non-wheat flour for use in composite flour for human consumption.

2. Normative reference

Nigerian Industrial Standard for Cassava Starch – NIS 386: 2004 Nigerian Industrial Standard for Wheat Flour – NIS121: 2000 Codex Alimentarius Commission (CAC/RCP1–1969), Rev. 2–1985 Vol.1B.

Codex Alimentarius Commission (CAC/RS. /100-1978-1969).

3. Description

3.1 Product definition

Flour is the finely ground endosperm of cereals, or the dried, milled contents of peeled roots and tubers having particle sizes not larger than 180 microns (0.2 mm) mesh. It shall be free from bran, germ, and fiber. It shall have an extraction rate of not more than 72 percent.

3.1.1 Composite flour

The combination of wheat flour and one or more non-wheat flours from indigenous cereals, roots, tubers, legumes, or oilseeds, for the production of bread and other baked products.

The combination of non-wheat flours from roots of indigenous cereals or legumes for use in local recipes.

4. Essential composition and quality factors

The color, flavor (whether natural or induced by processing), and particle size of the non-wheat flour shall be of a proportion not noticeable in the product.

The composite flour shall be free from rancidity, objectionable odor, color, flavor, insects, rodents, hair, and other extraneous materials.

4.1 Enrichment

High protein flours, when used as enrichment shall be free from harmful substances such as trypsin inhibitor in soybean flour, gossypol in cottonseed flour, and aflatoxin in legumes and cereals. It shall have acceptable tastes and color.

4.2 Levels of substitution of wheat flour with single non-wheat flour in composite flour shall be as shown in Table 9. Where more than one non-wheat flour is used, the sum of the individual components used shall not exceed the maximum level permitted for any one of the components.

Table	9. Level	of	substitution	of	wheat	flour	with	non-wheat
flour.								

Type of flour	% wt. of composite flour				
Sorghum	10-20				
Maize	10-25				
Millet	10-20				
Cassava flour	10-30				
Cassava starch	10-30				
Rice	10–30				

				Parameters			
Type of flour	Moisture content % (max)	Ash % (max)	Fiber % (max)	Fat % (max)	Protein % (min)	pH 10% Sol	HCN content (max)
Wheat	13	0.65	2.5	1.2	8	6-7	
Sorghum	12	1.2	1.5	3.0	8	6-7	
Maize	12	0.4	0.8	1.0	8	6-7	•
Millet	12	1.0	2.0	4.0	7	6-7	
Cassava flour	12	0.7	1.5	ı	1	6-7	10
Cassava starch	12	0.1		,	0.5	6-7	10
Rice	12	0.3	0.2	0.25	5	6-7	,

Table 10: Analytical characteristics of flours for use in composite flour.

5. Mandatory ingredients

Composite flour shall be mandatory fortified with vitamin A to the level not below 30 000 IU/kg.

6. Food additives

In addition to the NAFDAC regulations on food additives, all flour shall comply with the following:

	Min. value (mg/kg)
Thiamine	2.4
Niacin	16
Iron	16
Riboflavin	15.0

Treatment agents	Max. value (mg/kg)
Sulphur dioxide	200
Ammonium persulphate	200
Ascorbic acid	80
Chlorine dioxide (Dyox)	35
Benzoyl peroxide	50
Azodicarbonamide	45
Chlorine	40 0

Trace elements	Max value (mg/kg)
Arsenic	1.0
Cooper	1.0
Lead	2.0
7. Contaminants

The maximum level of contaminants shall be as follows:

7.1 All composite flour shall be free from pathogenic microorganisms.

- 7.2 When tested by appropriate methods of sampling and examination the product shall be free from microorganisms or their spores capable of developing under normal conditions of storage and shall not contain any substances of microbial origin in amounts, which may present a hazard to the health of the consumer.
- 7.3 In addition to 7.1 and 7.2 above, when analyzed by appropriate test methods, the flour shall comply specifically with the following microbial specifications indicated in Table 11.

Organism		Max. CFU/kg sample	
(a)	E. coli	Nil	
(b)	Enterobacteria	Nil	
(c)	Staph aureus	Nil	
(d)	Other coliforms	10 ²	
(e)	Mold	10 ²	
(f)	Yeast	10 ²	
(g)	Total count	104	
(h)	Toxigenic molds	Nil	

Table 11. Microbial specifications for composite flour.

8. Hygiene

The product shall be prepared, packed and stored under sanitary conditions and shall comply with the requirements of the public health authority and the regulations of NAFDAC.

9 Packaging, labeling, and storage

- 9.1 The flour shall be packed, transported, and stored in containers, which will safeguard the hygiene and organoleptic qualities of the product.
- 9.1.1 The packaging materials shall be such as to protect the product against bacteria and other contaminants; it shall protect the

product as far as possible against any infiltration of moisture, insect infestation, and leakage.

9.2 The packaging material shall not impact any odor, taste, or color and any other extraneous property to the product and shall not result in contamination of the product with substances of which the packaging material is made.

9.3 Labelling

9.3.1 The name of the food

The name of the product shall be composite four and shall be clearly and boldly written on the containers. The percentage substitution shall be clearly indicated.

9.3.2 List of ingredients

A complete list of ingredients shall be declared on the label in descending order of proportion.

9.3.3 Net content

The net weight shall be declared in the metric system of measurement and in accordance with Weights and Measure Act of 1974.

9.3.4 Name and address

The name and full location address of the manufacturer of the product shall be declared on the label

9.3.5 Lot identification

Each container shall be permanently marked in code or in clear to identify the producing factory and the lot.

9.3.6 Date marking

The expiry date of the product shall be clearly stated on the label.

9.3.7 Batch number

The batch number of the product shall be clearly stated on the label.

9.3.8 The "NIS" certification mark (if the manufacturer has a license) may be put on the label.

10. Methods of sampling and analysis

The product shall be sampled and analysed by international reference methods.

10.1 Sampling

Sampling shall be in accordance with the FAP/WHO Codex Alimentarius sampling plans for pre-packed foods (1969) (AOL - 6,5) Ref. ACA/BM. 42 1969).

10.1.1 To allow for adequate mixing, sampling at a mill shall be done on not less than 8 randomly selected containers. If the flour is from a millstream an interval of 10–15 minutes shall be allowed between each sample.

10.2 Method of analysis

The flour shall be assayed by any international standards method of analysis described in such manual as:

- i. The Association of Official Analytical Chemists (AOAC)
- ii. The American Association of Cereal Chemists (AACC)
- iii. The International Association of Cereal Chemistry (IACC); and
- iv. The International Organisation for Standardisation (ISO)

11. Criteria for conformity

A lot shall be declared as conforming to this standard if each sample inspected/analyzed conforms to all provisions of this standard.

NIS 386: 2004 - Standard for cassava starch (Food and industrial grade)

1. Scope

This standard prescribes the quality requirements, methods of processing, and tests for food and industrial grade cassava starch.

2. Normative references

- i. Report of the National Committee on Cassava, 2003
- Trends in drying of cassava in Africa (Sanni L, 2002 page 113 – 120 in 12th Symposium of ISTRC – Tsukuba Japan, Nakatani and Komaki)
- iii. IITA Annual Reports, 2000-2002.
- Raw Materials Research ad Development Council (Technical Information on Crop Production in Nigeria – 1994)
- v. Codex Alimentarius Commission (CAC/RCP1 1969, Rev. 2 – 1995, Vol.1B).
- vi. Codex Alimentarius Commission (CAC/RS /100 1978).

3. Classification

Cassava starch shall be classified as food grade or industrial grade.

3.1 Food-grade cassava starch

- is a white granular product that:
- is obtained by wet extraction process from mature cassava root. satisfies the quality requirements as outlined in Clause 4 of this standard.

3.2 Industrial grade starch

Industrial grade starch is starch other than food grade starch, which may or may not be modified.

4. Essential quality factors and analytical characteristics

4.1 Quality factors

4.1.1 Color

The color of cassava starch shall be white.

4.1.2 Taste and odor

Cassava starch shall be free from objectionable odor and taste.

4.1.3 Foreign matter

White granular cassava starch shall be free from foreign matters.

4.1.4 Particle size

Not less than 95% of mass of cassava starch shall pass easily through a sieve of $100-140\mu$ (0.1–0.12mm) mesh screen.

4.1.5 Solubility

The cassava starch shall not be soluble in cold water and in (96%) ethanol.

4.1.6 Iodine test

Cassava starch when tested with iodine shall give a blue-black coloration.

4.1.7 Analytical characteristics

Food grade starch shall comply with the analytical characteristics shown in Table 12.

Analytical characteristic	Requirement	
Total acidity (%) (max)	1.0	
pH	5-7	
Cyanide content (mg/kg) (max)	10.0	
Starch content (%) (min)	95.0	
Moisture (%) (max)	12.0	
Fiber (%) (max)	0.2	
Sulphated ash (%) (max)	0.6	
Viscosity or pasting properties	33-34 cSTM	
Acid insoluble ash (%) (max)	0.2	
Chloride (%) (max)	0.64	

Table 12. Analytical characteristics of cassava starch.

Note: Every other starch that does not conform to this table is classified as industrial starch.

5. Food additives

In addition to other additives approved by the NAFDAC, foodgrade cassava starch may contain ascorbic acid (0.2% maximum) as a color improver.

6. Hygiene

It is recommended that the product covered by the provisions of this standard shall be prepared in accordance with the International code of Hygiene Practice entitled "Recommended International code of Hygiene Practice General Principles of Food Hygiene" (CAC/RCP: 1–1969, Rev.1).

When tested by appropriate methods of sampling and examination, the product:

- shall be totally free from pathogenic microorganism;
- shall contain not more than total aerobic count of 10 000 CFU/g or mL;
- shall not contain any other poisonous extraneous or deleterious substances in amounts which may present hazard to health

7. Contaminants

Maximum residue limits for pesticides shall be in conformity with NAFDAC regulations on pesticide residues. In addition, it shall conform to prescribed levels of contaminants in Table 13.

Contaminants	Maximum level per- missible (in mg/kg of dry matter)	
Sodium (Na)	74	
Manganese (Mn)	12	
Iron (Fe)	22	
Copper (Cu)	4.3	
Bromine (Br)	6.6	
Zinc (Zn)	19	
Molybdenum (Mo)	17	
Aluminium (Al)	30	
Oxalate	26	
Lead (Pb)	0.1	
Cadmium (Cd)	0.1	

Table	13.	Permissible levels	of	contaminants	in	cassava
starch	n.					

8. Labelling

The package shall be hermetically sealed and marked with the following:

8.1.1 Name of the product

The name of the product to be shown on the label shall be "Food-grade Cassava Starch". The name shall indicate the particle size of the granules in accordance with the descriptions contained in section 4.1.4.

8.1.2 Net weight

Net weight shall be declared in metric system.

8.1.3 Name and address

The name and address of the manufacturer and/or packer shall be declared.

8.1.4 Date marking

The date of manufacture and batch number on packing shall be declared. The expiry date shall be well written on the label.

8.1.5 Country of origin

The country of the product shall be declared.

8.1.6 The NIS certification mark if the product is certified.

9. Packaging, transport, and storage

- 9.1 Food-grade cassava starch shall be packed, transported, and stored in containers, which will safeguard the hygienic and organoleptic qualities of the product.
- 9.2 The packaging material shall be such as to protect the product against bacteriological and other contamination; it shall protect the product as far as possible against any infiltration of moisture, insect infestation and leakage. The packaging material shall not impact any odour, taste colour or any other extraneous the product.

10. Method of analysis

The methods of analysis indicated hereafter are international reference methods.

- Determination of granularity: According to ISO: 2591–1973 "Test Sieving"
- Determination of Moisture Content: see Appendix A

- Determination of Total Acidity: see Appendix B
- Determination of Starch Content: see Appendix C
- Determination of Fiber Content: see Appendix D
- Determination of Sulphated Ash: see Appendix E
- Determination of Hydro--Cyanic Acid Content: see Appendix F

11. Criteria for conformity

A lot shall be declared as conforming to this standard if the following conditions are met.

11.2 Each sample inspected/analyzed for quality requirement conforms to clause 4 and 7 of this standard.

NIS 181: 2004 - Standard for garri

1. Scope

This Standard specifies the quality requirement, packaging, storage and methods of test for *garri*.

2. Description

2.1 Definition of the product

Garri is the granular finished product obtained by traditional or industrial processing of cassava roots (*Manihot utilisima, Mahihot esculanta*, and/or *Manihot palmate*), or other edible *Manihot* species. Root processing consists of peeling, washing, and grating of the roots followed by fermentation, pressing, breaking of the cake, sifting and partial dehydration of the cassava cake, and then final drying.

2.2 Classification

Garri grains are classified in five categories as follows:

2.2.1 Extra-fine grain garri

This is garri of which not less than 80% of the weight shall pass easily through a sieve with aperture below 355 microns.

2.2.2 Fine grain garri

This is *garri* of which not less than 80% of the weight shall pass easily through a sieve with aperture 1000 microns but of which less than 80% of the weight shall pass easily through a sieve with aperture 355 microns.

2.2.3 Coarse grain garri

This is garri of which not less than 80% of the weight shall pass easily through a sieve with aperture 1.4 mm but of which less than 80% of the weight shall pass through a sieve with the aperture 1 mm.

2.2.4 Extra coarse grain garri

This is garri of which not more than 20% of the weight shall pass easily through a sieve with aperture 1.4 mm.

2.2.5 Ungraded garri

This is garri, which has not been classified by the sieve method to determine its category according to grain size.

3. Essential composition and quality factors

3.1 Raw materials

Garri shall be prepared from clean cassava roots of Manihot utilisima or Manihot palmate, Manihot esculanta (Grants) or any other species.

3.2 Organoleptic properties

The colour of the *garri* shall be yellow (with palm oil) or white without palm oil. Taste and odor of *garri* shall be characteristic of the product as is acceptable in a given locality.

3.3 Analytical characteristics

3.3.1 Total acidity

The total acidity of garri shall not be more than 1% m/m measured as lactic acid.

3.3.2 Total cyanide (free and bound)

Total cyanide content of garri shall not exceed 20.0 mg/kg.

3.3.3 Moisture

The moisture content of garri shall not exceed 7.0% m/m.

3.3.4 Crude fiber content

The crude fiber content of garri shall not exceed 2% m/m.

3.3.5 Ash content

The ash content shall not exceed 1.5% m/m.

3.4 Food additives

Garri shall contain one or several of the following ingredients.

3.4.1 Food Grade Palm Oil (According to NIS 230: 2000).

3.4.2 Enrichment

The addition of vitamins, proteins, and other nutrients for enrichment shall be in conformity with the Food and Drugs Regulation of the Federal Ministry of Health. No other food additives shall be added to *garri*.

4. Contaminants

Maximum residue limits for pesticides shall be in conformity with the Food and Drugs Regulation on the pesticide residues or as recommended by Codex Alimentarius Commission (CAC/RS/100–1978).

5. Hygiene

It is recommended that the product covered by the provisions of this standard shall be prepared in accordance with the International Code of Hygienic Practices entitled "Recommended International Code of Hygiene" (CAS/RCP: 1–1969, Rev. 1)

- 5.1 When tested by appropriate methods of sampling and examination, the product:
- should be free from pathogenic microorganisms;
- should be free from substances originating from microorganism in amount which may represent a hazard to health; and
- should not contain any poisonous or extraneous and deleterious sub
- stances in amounts which may represent a hazard to health.

6. Labelling

The package shall be securely closed and marked with the following:

6.1 Name of the product

The name of the product to be shown on the label shall be "Garri". The name shall show the size of the grain in accordance with the description contained in clause 2.2.

6.2 List of ingredients

A complete list of the ingredients shall be declared on the label in descending order of proportion.

6.3 Net weight

Net weight shall be declared in metric system.

6.4 Name and address

The name and address of the manufacturer and/or packer shall be declared (Location address).

6.5 Date marking

The date of manufacture or packaging shall be declared.

7. Packaging, transport, and storage

- 7.1 *Garri* shall be packaged, transported, and stored in unused containers, which will safeguard the hygienic, nutritional, and the organoleptic qualities of the products.
- 7.2 The packaging material shall be such as to protect the product against bacteriological and other contamination. It shall protect the products against any infiltration, rehydration, and against leaking. The packaging material shall not result in contamination of the product with substances of which the packaging material is made.

8. Methods of analysis and sampling

The methods of sampling and analysis indicated hereafter are international references methods.

8.1 Sampling

The sampling shall be as elaborated in ISO 2170-1972: Cereals and Pulses Sampling of the Milled Products.

- 8.2 Determination of granularity According to ISO 2590–1973–Test Sieving
- 8.3 Determination of moisture (See Appendix A)
- 8.4 Determination of total acidity (See Appendix B)
- 8.5 Determination of carbohydrate content (See Appendix C)
- 8.6 Determination of crude fiber content (See Appendix D)
- 8.7 Determination of fat content (See Appendix H)
- 8.8 Determination of crude protein content (See Appendix G)
- 8.9 Determination of ash content (See Appendix E)
- 8.10 Determination of hydrocyanic acid content (See Appendix F)

Chapter three

Other national and international standards on cassava and cassava products

Malawi Standard MS 349–2002: Edible cassava flour

1. Scope

This Malawi standard applies to cassava flour intended for human consumption.

2. Normative reference

The following standards contain provisions, which through reference constitute provisions of this Malawi standard. All standards are subject to revision and parties to agreements based on this Malawi standard are encouraged to apply the most recent editions of the standard listed below:

MIS 19: General standard for labelling of prepackaged foods MS 21: Code of hygienic conditions for food and food processing units MIS 610: Cereal and cereal products—determination of moisture content (basic reference)

3. Description of the product

3.1 Product description

Edible cassava (*Manihot esculenta* Crantz) flour is the product prepared from dried cassava chips or paste by a pounding, grinding, or milling process, followed by sifting to separate the fiber from the flour. In case of edible cassava flour prepared from bitter cassava (*Manihot utilisima* Pohl), detoxification is carried out by soaking the roots in water for a few days before they undergo drying in the form of whole, pounded root (paste) or in small pieces.

3.2 Classification

Edible cassava flour is classified into two categories:

3.2.1 Fine cassava flour

Edible cassava flour of which not less than 90% by weight shall pass through a sieve of 0.6 mm aperture size.

3.2.2 Coarse cassava flour

Edible cassava flour of which not less than 90% by weight shall pass through a sieve of 1.20 mm aperture size.

4. Essential composition of quality factors

Raw materials: The cassava root from which the cassava flour is milled shall be peeled, clean, and in good physiological condition. If the cassava root from which the cassava flour is milled is bitter, then it shall be soaked for a few days to detoxify it, before drying and milling.

Organoleptic properties: The color, taste, and odor of edible cassava flour shall be characteristic of the product. Edible cassava flour shall conform to the requirements in Table 14 below:

Table 14. Composition and chemical requirements for edible cassava flour.

Characteristic	Requirement	
Cyanogen content	10 mg HCN equivalent max	
Moisture content	13% m/m, max	
Crude fiber content	2% m/m, max	
Ash content	3% m/m, max	

4.1 Microbiological requirements

Cassava flour shall conform to microbiological requirements given in the Table 15 below:

Table 15. Microbiological requirements.

Characteristic	Requirement per gram (except Salmonella, per 25g)	
Mesophilic aerobic bacteria	10 ⁶ max	
Coliform bacteria	10 ² max	
Escherichia coli	10 max	
Salmonella	NIL	
Yeast and molds	10 ³ max	

5 Hygiene

- 5.1 The product covered by the provisions of this Malawi standard shall be prepared and handled under hygienic conditions prescribed in MS 21.
- 5.2 Edible cassava flour shall be prepared with special care under good manufacturing practices so that residues of those pesticides which may be required in the production, storage, or processing of the cassava, cassava chips, cassava flour or the premises and equipment used for processing, do not remain, or if technically unavoidable, are reduced to the maximum extent possible.

6. Food additives

No food additive shall be added to edible cassava flour.

7. Packaging, transport, and storage

- 7.1 Edible cassava flour shall be packaged, transported, or stored in containers, which will safeguard the hygienic, nutritional, technological, and organoleptic qualities of the product.
- 7.2 The packaging material shall be as such as to protect the product against bacteriological and other contamination, it shall protect the product as far as possible against any infiltration of moisture, rehydration and against leakage.
- 7.3 The packaging material shall not impart any odor, taste, or color or any other extraneous property to the product and shall not result in contamination of the product with substances of which the packaging material is made.

8. Labelling

In addition to the requirements of MS 19, the following provisions shall apply:

8.1 Name of the food.

The name of the food to be shown on the label shall be edible cassava flour preceded or followed by the common or ordinary name legally accepted in Malawi. The name shall show the particle size of the flour in accordance with descriptions contained in sections 3.2.1 and 3.2.2.

8.2 Net content.

The net content of the product shall be declared by mass in metric unit.

8.3 Name and address.

The name and address of the manufacturer, packer, distributor, or vendor of the product shall be declared.

8.4 Country of origin.

The country of origin of the product shall be declared. The words "Madel Processed in Malawi" shall be legibly printed on all labels and outer wrappers for products manufactured or processed in Malawi and shall not be obscured by any other outer wrapper.

8.5 Lot identification.

Each package shall be permanently marked to identify the producing country.

Note: Marks shall be printed using an ink of good quality or paint not containing lead. Under no condition shall these marks be in contact with the product.

9 Methods of sampling and test

The analysis procedures shall be in accordance with the methods recommended—MS 146, 148, and 149.

Ghana standards for fresh sweet cassava 2004

1. Scope

This Ghana standard specifies the requirements for commercial sweet varieties of cassava roots grown from *Manihot esculenta* Crantz of the Euphorbiaceous family, to be supplied fresh to the consumer, after preparation and packaging. Cassava for industrial processing is excluded.

2. References

The following references contain provisions applicable to this Ghana standard. At the time of publication, the editions indicated were valid.

All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

- CAC/RCP 44–1995; Code of Practice for Packaging and Transport of Tropical Fresh Fruit and Vegetables of Food Hygiene.
- CAC/RCP 1–1969, Rev. 3–1997 Recommended International Code of Practice – General Principles of Food Hygiene.
- CAC/GL 21–1997; Principles for the Establishment and Application of Microbiological Criteria for Foods.
- · GS 46: 1990; Labelling of Prepackaged Foods.

3. Definitions

Clean: Practically free of any visible foreign matter, except permitted substances used to prolong its shelf-life.

Dry: The cassava roots are free from external moisture, excluding consideration due to cold storage.

Well shaped: Cassava is not so curved, crooked, constricted, ridged, or otherwise misshapen that its appearance is appreciably affected.

Fairly well-shaped: Cassava is not so curved, crooked, constricted, ridged or otherwise misshapen that its appearance is materially affected, or there is a loss of more than 5% of the total weight of the cassava in the ordinary preparation for use.

Badly misshapen: Cassava is so curved, crooked, constricted, ridged, or otherwise misshapen that its appearance is seriously affected, or there is a loss of more than 10% of the total weight of cassava in the ordinary preparation for use.

Sound: The produce is not affected by rotting or deterioration such as to make it unfit for consumption.

Sweet varieties of cassava: This refers to the varieties of cassava that contain less than 50 mg/kg hydrogen cyanide (fresh weight basis).

4. General requirements

4.1 Minimum requirements

In all classes, subject to the special provisions for each and the tolerances allowed, the cassava must be:

- whole
- firm
- sound
- practically free from mechanical damage and bruising;
- clean
- practically free from pests affecting the general appearance of the produce
- practically free from damage caused by pests
- dry
- free of loss of color in the flesh
- free from growth cracks
- free from soil particles
- free of any foreign smell and/or taste.

The cut at the distal (narrow) end of the cassava should not exceed 2.0 cm in diameter. The stalk end of the root should have a clean cut between 1.0 and 2.5 cm in length.

The cassava must have been carefully harvested and have reached an appropriate degree of physiological development; account being taken of the characteristics of the variety and to the area in which they are grown.

The development and condition of the cassava must be such as to enable it to:

- withstand transport and handling, and
- arrive in satisfactory condition at the place of destination.

5. Classification

Cassava is classified in three classes defined below:

5.1 "Extra" class

Cassava in this class:

- must be of superior quality
- must be characteristic of the variety and/or commercial type
- must be free of defects, with the exception of very slight superficial defects, provided these do not affect the general appearance of the produce, the quality, the shelf-life, and presentation in the package.

5.2 Class I

Cassava in this class must be of good quality. It must be characteristic of the variety and/or commercial type. The following slight defects, however, may be allowed, provided these do not affect the general appearance of the produce, the quality, the shelf-life and presentation in the package:

- · fairly well shaped;
- scarring or healed damage, not exceeding 5% of the surface area;
- scraped areas, not exceeding 10% of the surface area.

The defects must not, in any case, affect the pulp of the produce.

5.3 Class II

This class includes cassava that does not qualify for inclusion in the higher classes, but satisfy the minimum requirements specified in section 4.1 above, the following defects may be allowed, provided the cassava retains its essential characteristics as regards the quality, the shelf life, and presentation:

- not badly misshapen
- scarring or healed damage, not exceeding 10% of the surface area;
- scraped areas, not exceeding 20% of the surface area.
 The defects must not, in any case, affect the pulp of the produce.

6. Size

Size is determined by the diameter at the thickest cross-section of the produce, in accordance with the following Table 16.

In all cases, cassava must not be less than 300 g in weight nor less than 20 cm in length.

Size code	Diameter (cm)	
A	3.5-6.0	
В	6.1-8.0	
С	>8.0	

Table 16. Size of produce in diameter for Ghana.

7. Tolerances

Tolerances in respect of quality and size shall be allowed in each package for produce not satisfying the requirements of the class indicated.

7.1 Quality tolerances

"Extra" Class

Five percent by number or weight of cassava not satisfying the requirements of the class, but meeting those of class I.

Class I

Ten percent by number or weight of cassava not satisfying the requirements of the class, but meeting those of Class II.

Class II

Ten percent by number or weight of cassava satisfying neither the requirements of the class nor the minimum requirements, with the exception of produce affected by rotting or any other deterioration rendering it unfit for consumption.

7.2 Size tolerances

For all classes, 10% by number or weight of cassava corresponding to the size immediately above and/or below that indicated on the package.

8. Uniformity

The contents of each package must be uniform in shape and contain only cassava of the same origin, variety and/or commercial type, quality, and size. The visible part of the contents of the package must be representative of the entire contents.

9. Packaging and labelling

9.1 Packaging

Cassava must be packed in such a way as to protect the produce properly. The materials used inside the package must be new, clean, and of a quality to avoid external or internal damage to the produce. Using paper or stamps bearing trade specifications is allowed, provided the printing or labeling has been done with non-toxic ink or glue. Cassava should be packed in each container in compliance with the Recommended International Code of Practice for Packaging and Transport of Tropical Fresh Fruit and Vegetables (CAC/RCP 44–1995).

9.2 Description of containers

The containers must meet the quality, hygiene, ventilation, and resistance characteristics to ensure suitable handling, shipping, and preservation of the cassava. Packages must be free from foreign matter and offensive odor.

9.3 Labelling

Each package of cassava must be legibly marked with the following information:

- a. name of produce
- b. variety/cultivar or type
- c. size
- d. quality classification
- e. packing date
- f. country of origin
- g. name and address of exporter/packer
- h. net weight
- i. gross weight of the package
- j. postharvest treatment (optional)
- k. storage humidity and temperature

Each package must bear the above information in letters grouped on the same side, legibly and indelibly marked, and visible from the outside and also in the documents accompanying the shipment.

Labelling of consumer package

In addition to the requirements of the Ghana Standards for the Labellin of Prepackaged Foods (GS 46: 1990), the following specific provisio apply:

Nature of produce

Each package must be labeled with the name of the produce and typ (sweet) as well as name of the variety.

Preparation instructions

A statement indicating that cassava should be peeled and fully cooke before being consumed is required.

10. Contaminants

10.1 Heavy metals

Cassava must comply with those maximum levels for heavy metals established by the Codex Alimentarius commission for this commodity.

10.2 Pesticide residues

Cassava must comply with those maximum residue limits established b the Codex Alimentarius commission for this commodity.

CODEX STAN 176–1995: Codex Standard for edible cassava flour

1. Scope

This standard applies to cassava flour intended for direct human consumption and which is obtained from the processing of edible cassava (Manihot esculenta Crantz).

2. Definitions of the product

Edible cassava (*Manihot esculenta* Crantz) flour is the product prepared from dried cassava chips or paste by a pounding, grinding, or milling process, followed by sifting to separate the fiber from the flour. In case of edible cassava flour prepared from bitter cassava (*Manihot utilisima* Pohl), detoxification is carried out by soaking the roots in water for a few days, before they undergo drying in the form of whole, pounded root (paste) or in small pieces.

3. Essential composition and quality factors

3.1 Quality factors - general

Edible cassava flour shall be:

- safe and suitable for human consumption.
- · free from abnormal flavors, odors, living insects, and mites.
- free from filth (impurities of animal origin, including dead insects) in amounts which may represent a hazard to human health.

3.2 Quality factors-specific

Moisture content 13% m/m (max). Lower moisture limits are required for certain destinations in relation to the climate, duration of transport, and storage.

3.2.1 Hydrocyanic acid content

The total hydrocyanic acid content of edible cassava flour shall not exceed 10 mg/kg.

4. Contaminants

4.1 Heavy metals

Edible cassava flour shall be free from heavy metals in amounts which may represent a hazard to human health.

4.2 Pesticide residues

Edible cassava flour shall comply with those maximum residue limits established by the Codex Committee on Pesticide Residues for this commodity.

4.3 Mycotoxins

Edible cassava flour shall comply with those maximum residue limits established by the Codex Committee on Food Additives and Contaminants for this commodity.

5. Hygiene

It is recommended that the product covered by the provision of this standard be prepared and handled in accordance with the appropriate sections of the Recommended International Code of Practice-General Principles of Food Hygiene (CAC/RCP 1-1969, Rev. 2-1985), and other Codes of Practice recommended by the Codex Alimentarius Commission which are relevant to this product.

To the extent possible in good manufacturing practice, the product shall be free from objectionable matter.

6. Packaging

Edible cassava flour shall be packaged in containers which will safeguard the hygienic, nutritional, technological, and organoleptic qualities of the product. The containers, including packaging material, shall be made of substances which are safe and suitable for their intended use. They should not impart any toxic substance or undesirable odor or flavor to the product. When the product is packaged in sacks, these shall be clean, sturdy, and strongly sewn or sealed.

7. Labeling

In addition to requirements of the Codex General Standard for the Labeling of Prepackaged Foods CODEX STAN 1-1985 (Rev.1, 1985) Codex Alimentarius Volume 1, following specific provisions apply:

7.1 Name of the product

The name of the product to be shown on the label shall be in accordance with the definitions given in Section 2.1. The alternative names given in parenthesis shall be used in accordance with local practice.

7.2 Labeling of non-retail containers

Information for non-retail containers shall be given either on the container or in accompanying documents, except that the name of the product, lot identification, and the name and address of the manufacturer or packer shall appear on the container. However, lot identification and the name and address of the manufacturer or packer may be replaced by an identification mark, provided that such a mark is clearly identifiable with the accompanying documents.

8. Analysis

8.1 Determination of moisture

According to ISO 712-1985 Cereals and Cereal Products - Determination of Moisture (routine reference method).

8.2 Determination of total hydrocyanic acid

Method to be selected.

9. Annex

Provisions provided within the Annex are not considered as essential for the protection of consumer health or safety. The following provisions are of an advisory nature reflecting quality factors and criteria typically used by commerce to define or describe the quality of product purchased. Individual merchandise should independently determine their product quality needs. These guidelines are intended to assist users of the Codex standard when asking international purchases and are, therefore, not subject to formal acceptance by users of the standard. In those instances where more than one factor limit and/or method of analysis is given we strongly recommend that users specify the appropriate limit and method of analysis (Table 17).

Factor/Description	Limit	Method of analysis
Crude fiber Ash	Max: 2.0% Max: 3.0%	SO 5498 (1981) - Determination of Crude Fiber Con- tent—B.S. Separa- tion by filtration through filter paper - General Method ISO 2171 (1980) - Cereals, Pulses and Derived Products - Pulses and Derived Products - Determi- nation of Ash (Type
Food additives	Conform with legislation of the country in which the product is sold	I Method) None defined
Particle size - fine Min: 90% shall pass flour through a 0.60 mm sieve		None defined
Particle size - coarse flour	Min: 90% shall pass through a 1.20 mm sieve	None defined

Table 17. Appropriate limit and method of analysis.

TIS 52–2516 (1973). Thai industrial standard for tapioca products

1. Scope

This standard prescribes requirements, packaging, and marking; methods of sampling; and analysis for tapioca products.

2. Definitions

For the purpose of this standard, the following definitions shall apply:

- 2.1 Tapioca product. Tapioca which has been processed from tapioca roots and dried may be in meal or piece, chip, sheet, pellet, bar, granule or other form excluding tapioca starch and dregs.
- 2.2 Foreign materials: Materials that are not the composition in nature of tapioca roots.
- 2.3 Ash: Residue obtained after igniting tapioca product to constant weight.
- 2.4 Sand: Acid-insoluble ash.
- 2.5 Crude fiber: Residue remaining after digesting tapioca product with acid and alkaline and which can be burnt.

3. Requirements

Tapioca products shall conform to the following requirements

- 3.1 Starch shall comply with Table 18.
- 3.2 Sand or silica shall comply with Table 18.
- 3.3 Crude fiber shall comply with Table 18.
- 3.4 Moisture shall comply with Table 18, except that in products intended for further processing into pellets, bars, or granules, the moisture shall not be more than 16.0% of weight during October to May and not more than 17.0% of weight during June to September

CharacteristicLimitTest method (clause)StarchTo be developed6.1Sand3.0% of weight, max6.2Crude fiber5.0% of weight, max6.3Moisture14.0% of weight, max6.4

Table 18: Thai requirements for tapioca.

Note: In case the ash content obtained during the determination of sand content is more than 4.5% of weight, this ash content shall also be reported.

4. Packaging and marking

- 4.1 Where product is packaged, the material used for the purpose shall be free from tears, leaks, or abnormal odor, be of adequate rigidity and workmanship, and marked with the following information.
- 4.1.1 Name and nature of the product
- 4.1.2 Name of manufacturer
- 4.1.3 Net weight

Any person who manufactures products complying with this standard may use the standards mark in connection with his products only after having received a license from the Industrial Product Standards Council.

5. Method of sampling

The sample collected shall be thoroughly mixed (Table 19). Where the sample collected is less than 3 kg, more samples shall be taken to obtain a total sample weight of 3 kg. Where the total sample weight is more than 3 kg, the sample shall be quarterly subdivided until 3 kg is obtained. The sample so obtained shall be divided into 3 parts, each kept in a clean container sealed with the information indicating the date of sampling and signature of sampler. One part shall be retained by the manufacturer, one by the purchaser, and the other used for testing.

Lot size metric tons	Number of sampling points min.	
Up to 50	10	
51 up to 200	20	
201 up to 500	30	
501 up to 5000	50	
Over 5000	80	

Table 19. Sampling (clause 5).

Chapter four

Requirements for conformity assessment and guidelines for export from Nigeria

1 Certification of conformity to standards and quality assurance

1.1 Definition of certification

Certification is a procedure by which a third party gives written assurance that a product, process or service conforms to specified requirements. (Defnition: ISO/IEC Guide 2: 1996). It is distinct from the othe systems of proof of conformity such as supplier declarations, laboratory test reports, or inspection body reports. Certification is based on the results of tests, inspections, and audits and gives confidence to the cutomer on account of the systematic intervention of a competent third body.

1.2 The role of certification

Certification is an asset and an advantage, both for the producer and for the purchaser, consumer or distributor. It gives an incontestable added value to the product or service bearing its mark.

For the manufacturer or service provider, it valorizes the goods or service, it opens up markets and simplifies relations.

For the user, it provides assurance that the product purchased meets defined characteristics or that an organization's processes meets specified requirements. Certain product certification marks may represent an assurance of safety and quality. Certification enables one to distinguish apparently identical products or services; it offers to everyone a possibility of appeal in the event of dissatisfaction.

1.3 Types of certification

Product certification attests that a product complies with the safety fitness for use, and/or interchangeability characteristics defined in standard(s), and in specification(s) supplementary to standards where they are requested by the market.

Organization certification demonstrates the conformity of, for example, an organization's quality or environmental management system to the relevant model of the ISO 9000 or ISO 14000 series of management system standards. The different systems of reference are not attached to the performance level of a product.

1.4 Accreditation of testing laboratories

Manufacturers may need the technical help of independent testing laboratories either for developing new products or at the marketing and export stage. Many industrialized countries have made substantial attempts to develop laboratory networks that provide assurance of the quality of testing services (mainly in terms of the quality of results on which they base their decisions).

At international level, this activity falls within the scope of the International Laboratory Accreditation Cooperation (ILAC). One of the objectives of this coordination is to provide companies with better access to the services of those laboratories which are most likely to meet their testing needs and optimize the use of these means.

At national level, there are a number of laboratory networks. The national standards bodies may be contacted for information relative to their countries.

2. Guidelines/requirements for pre-shipment destination: Quality inspection of export

Following Federal Government mandate to SON to participate in the regulation of the quality of goods imported into and exported out of the Country in the Destination Inspection Scheme, members of the public and manufacturers in particular, wishing to import or export are advised to take note of these guidelines which are design to acquaint them with SON general requirements/Guidelines for pre-shipment and Destination Quality Inspections of Export and Import products respectively. This is part of the published Federal Republic of Nigeria Procedures and Guidelines for Import and Export Trade in Nigeria to ensure Conformity of product with specified requirements.

2.1 Category of items under inspection & examination by SON.

- chemical and Allied Products
- civil Engineering related Products
- electrical/Electronic Products
- food and Codex Products
- mechanical Engineering related Products
- textile and Leather Products

Other items or product as may from time to time be directed for sampling by the Federal Government through the authority of the Director General/Executive (SON).

The general requirements are as follows:

SON inspectors are at the various terminals/sheds at airports, seaports and borders. The officers for the timely release of goods follow the following procedures:

Importers or their representative shall submit to SON inspector the following documents prior to joint customs examination at the terminals /sheds:

- photocopies of bill of lading, packing list/invoice and CCVO (Combined Certificate of Value & Origins)
- address of Importers Warehouse(s)
- SON terminal/Shed inspector(s) shall attend joint customs examination of goods on collection of items 1 and 2 do the following at the examination bay
- samples the imported items of interest according to SON sampling plan
- fill and endorse the inspection and sampling record sheet (FORM014/01)
- submit the above record sheet to the importer or representa tive to endorse the appropriate column
- physically assess the product(s) for defects and on satisfactory physical examination issue Conditional release letter to importer on payment of SON labo ratory testing in bank draft to SON

Unsatisfactory physical examination attracts detention notices from SON to Nigeria Customs Service and Nigeria Ports Authority to prevent importer from carrying his/her goods until adequate security and guarantee are provided. All enquiries should be addressed to the Director General, Standards Organization of Nigeria and submitted to the nearest SON office.

2.2 Requirements for export

Prospective exporter, wishing to have his products certified, shall apply to the Director General Standards Organization of Nigeria (SON). The application shall be forwarded upon receipt of confirmed order for export, but not later than two weeks before shipment.

The following shall accompany the application:

- name and full location address of exporter
- name of product and importers specification(s)
- copy of completed NXP form (if available at the time of application, otherwise later)
- · copy of NEPC certificate of registration
- quantity/volume of export
- name and address of exporter (if different from (a) above)
- name and address of importer/buyer
- name and telephone number of exporters representative (if known)
- indication by exporter whether holder of NIS mark and /or NIS: ISO 9000 Certificate
- · type of packaging used or to be used
- exporters test report on product for export
- any other relevant information, e.g., date of manufacture, expiry date operational manual, proforma invoice, and standard to which product was manufactured (NIS, BSI, DIN, JIS, AFNOR, company standard, etc.) should be stated.

N.B. Preferably, products for export are to be inspected at the production site.

Product conformity assessment consist of the following stages

- examination and inspection of products sampling
- laboratory test/Analysis
- issuance of conformity testimonial/certificate shall apply to the consignment under the particular application
- 3. Procedure for SON participation in joint customs examination of imports
- photocopies of bill of lading, packing list/invoice, and CCVO (Combined Certificate of Value & Origins)
- address of importers warehouse(s)
- SON terminal /shed inspector(s) shall attend joint customs examination of goods on collection of items 1 and 2 do the following at the examination bay

- sample the imported items of interest according to SON sampling plan
- fill and endorse the inspection and sampling record sheet (FORM014/01)
- submit the above record sheet to the importer or representative to endorse the appropriate column
- physically assess the product(s) to detect and take the following action(s):
- on satisfactory physical examination issue conditional release letter to importer on payment of SON laboratory testing fee in bank draft to SON

unsatisfactory physical examination attracts detention notices from SON to Nigeria Customs Service and Nigeria Ports Authority to prevent importers from carrying their goods until adequate security and guarantee are provided. All enquiries should be addressed to the Director General, Standards Organization of Nigeria and submitted to the nearest SON office.

Chapter five General information
- 1. List of documents for product registration inspection reports for food, water, cosmetic and medical devices by the NAFDAC Inspectorate Headquarters, Abuja
- 1. request for application letter on company's letter headed paper for production inspection.
- 2. evidence of payment
- 3. certificate of incorporation of the company/trade mark certificate
- 4. organogram of the company showing names of key personnel
- 5. letter of employment of key officers, acceptance of offer of employment by these officers
- photocopies of certificate and curriculum vitae of key officers especially production manager, quality control manager (where-inhouse laboratory exists).
- 7. standards operating procedure for production
- 8. standards operating procedure for quality control.
- 9. standards operating procedure for cleaning of factory and equipment
- 10. list of production/quality control equipment where applicable
- 11. contractual agreement with a public analyst where applicable indicating frequency of sampling/tests.
- 12. certificate of analysis of raw materials and finished products
- 13. food handlers test or medical certificate of fitness for workers
- 14. evidence of fumigation
- 15. geological survey report of borehole where applicable/water corporation receipt.
- 16. label/package
- 17. batch formulation where applicable
- 18. photographs

2. Factory specification

The factory building required for NAFDAC registration must be a whole building or boys quarters or duplex that can be separately fenced. The rooms should contain at least:

- 1. cloak room (male and female section)
- 2. raw materials room

- 3. processing room
- 4. finished products room
- 5. storage room
- 6. have pipe borne water or borehole of about 190 m²
- 7. free from contamination
- 8. not be closed to sewage, refuge dump, abattoir, cemetery, emission producing company, or company that can pollute the environment.
- 9. consult a public analyst who must be a member of the Institute of Public Analyst of Nigeria.

These guidelines are for the interest of the general public, and in particular, food and beverage industries in Nigeria. NAFDAC emphasizes that no processed food shall be manufactured, imported, exported, advertised, sold or distributed in Nigeria unless it has been registered in accordance with Provisions of Decree 19 of 1993 as amended by Food, Drugs and Related Products (Registration) Decree No. 20 of 1999. For full details about NAFDAC registration visit www.nafdacnigeria.org.

Quality criterion	Africa	Colombia	Europe	Nigeria	Thailand
Cassava Chips					
Aflatoxins		Negative			
Ash content		3% max		3.0%	
Clostridium		100 max			
Coliforms		10x1000 max			
Crude cellulose					
Crude fiber		4% max		3.0%	5% max
Hydrocynic acid		100 ppm		10mg/kg max	100 ppm
Escherichia coli		Negative			••
Fungi		10x1000 max			
Mesophiles		10x10 max			
Moisture content		12% max		10% max	16% max
Packaging					
Salmonella		Negative			
Sand		0			4% max
Sealing					
Starch content		65% min		75% min	65% min
Cassava flour					
Aerobic bacterial meso-		2x10 cfu			
philes (cfu)					
Aflatovine		0			
Arb content	30%	704		0 Gm/m	
Coliforme	370	1210 cfs		0.0m/m	
Crude cellulore		504			
Crude fiber	204	2 50%		204	
Eccherichia cali	270	2.)70		270	
Fungue and veset count		1×1000			
HCN		50mg/kg		10 mg/kg	
Moisture content	1306	12%		1004	
Pachoning	13%	12.70		1070	
Calmon alla		0			
Sand	100%	o per gram		306	
Senting	1070	370		370 max	
Starch content		6296 min		65 70% min	
Starch content		0270 IBII		0)-/0% hum	
Pellets					
Crude fiber			5% max		
Flour			8% max		
			l mm		
			mesh		
Foreign matter			none		
Hardness			12		
			ka/foot		
			2 min		
			2 min		

General industrial product standards.

Quality criterion	Africa	Colombia	Europe	Nigeria	Thailand
Moisture content			14%max		
Sand			3% max		
Starch content			65%		
			min		
Pellets for animal feed					
Ash content				1.8-3.9%	
Crude fiber				2.1-5.0%	
Moisture content				10-14%	
Starch content				70-82%	
Starch for food					
Total acidity				1.0% lactic m	ax
Sulphated ash				0.6% max	
Moisture content				12% max	
PH				5.0-7.0	
Fiber				0.2% max	
Acid insoluble ash				0.2% max	
Starch content				85% min	
Viscosity				33-34 cSTM	

General industrial product standards (contd).

CLAT (2004) and Standards Organization of Nigeria (2004).

3. Addresses of Standard Organisation of Nigeria (SON) location in Nigeria

1. SON Zonal Office 11, Kofo Abayomi Street Victoria Island, Lagos	8. SON Zonal Office 8, Aba Road, Portharcourt Rivers State
Tel: 01-615867, 4616562	Tel: 084-330128
2. SON Zonal Office	9. SON Zonal Office
5, Ozubulu Street	Federal Secretariat Complex
Independence Layout,	Uyo, Akwa-Ibom State
PMB 01232, Enugu State	Tel: 085-200460, 08023091137
Tel: 042-451667	
3. SON Zonal Office	10. SON Zonal Office
Federal Secretariat Complex	Federal Secretariat Complex
(Room 201-203)	PMB 2083 Jimeta, Yola
Ikolaba, Ibadan	Tel: 075-627403
Tel: 02-8102975	
4. SON Zonal Office	11. SON Zonal Office
4. SON Zonal Office 10, Rayfield Road,	11. SON Zonal Office Federal Secretariat Complex
4. SON Zonal Office 10, Rayfield Road, Bukuru, Jos, PMB 02102,	11. SON Zonal Office Federal Secretariat Complex Aduwawa, Benin City
4. SON Zonal Office 10, Rayfield Road, Bukuru, Jos, PMB 02102, JOS	11. SON Zonal Office Federal Secretariat Complex Aduwawa, Benin City Edo State
4. SON Zonal Office 10, Rayfield Road, Bukuru, Jos, PMB 02102, JOS Tel: 073-280070	11. SON Zonal Office Federal Secretariat Complex Aduwawa, Benin City Edo State Tel: 090-417267
 4. SON Zonal Office Rayfield Road, Bukuru, Jos, PMB 02102, JOS Tel: 073-280070 5. SON Zonal Office 	 11. SON Zonal Office Federal Secretariat Complex Aduwawa, Benin City Edo State Tel: 090-417267 12. SON Zonal Office
 4. SON Zonal Office Rayfield Road, Bukuru, Jos, PMB 02102, JOS Tel: 073-280070 5. SON Zonal Office 3rd floor, Federal Secretariat, 	 11. SON Zonal Office Federal Secretariat Complex Aduwawa, Benin City Edo State Tel: 090-417267 12. SON Zonal Office Emene Industrial Layout
 4. SON Zonal Office Rayfield Road, Bukuru, Jos, PMB 02102, JOS Tel: 073-280070 5. SON Zonal Office dioor, Federal Secretariat, Kawo, Kaduna 	 11. SON Zonal Office Federal Secretariat Complex Aduwawa, Benin City Edo State Tel: 090-417267 12. SON Zonal Office Emene Industrial Layout Emene, Enugu
 4. SON Zonal Office Rayfield Road, Bukuru, Jos, PMB 02102, JOS Tel: 073-280070 5. SON Zonal Office ard floor, Federal Secretariat, Kawo, Kaduna Tel: 062-319705 	 11. SON Zonal Office Federal Secretariat Complex Aduwawa, Benin City Edo State Tel: 090-417267 12. SON Zonal Office Emene Industrial Layout Emene, Enugu Tel: 042-552768
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 4. SON Zonal Office Rayfield Road, Bukuru, Jos, PMB 02102, JOS Tel: 073-280070 5. SON Zonal Office ard floor, Federal Secretariat, Kawo, Kaduna Tel: 062-319705 6. SON Zonal Office Federal Secretariat 	 SON Zonal Office Federal Secretariat Complex Aduwawa, Benin City Edo State Tel: 090-417267 SON Zonal Office Emene Industrial Layout Emene, Enugu Tel: 042-552768 SON Zonal Office 10, Kaku Street, new Extension
 4. SON Zonal Office Rayfield Road, Bukuru, Jos, PMB 02102, JOS Tel: 073-280070 5. SON Zonal Office ard floor, Federal Secretariat, Kawo, Kaduna Tel: 062-319705 6. SON Zonal Office Federal Secretariat PMB 3492, Kano 	 SON Zonal Office Federal Secretariat Complex Aduwawa, Benin City Edo State Tel: 090-417267 SON Zonal Office Emene Industrial Layout Emene, Enugu Tel: 042-552768 SON Zonal Office 10, Kaku Street, new Extension Kubau, Kaduna

3. Addresses of Standard Organisation of Nigeria (SON) location in Nigeria(contd).

7. SON Zonal Office SON Complex, Bosso Road Opposite Day Secondary School PMB 166, Minna, Niger State Tel: 066-224882	14. SON Corporate Headquarters Plot 1687, Lome Street, Wuse Zone 7, Abuja Tel: 09-5239187 or 09-5239353	
	15. SON Operational Headquarters Plot 13/14, Victoria Arobieke Street, Off Admiralty way, Lekki peninsula Scheme 1, Lekki-Lagos Tel: 01-2708230–5	

4.	National Agency for Food and Drugs Administration
	and Control (NAFDAC) Offices

Abuja Corporate Headquarters Plot 2032 Olusegun Obasanjo Way, Wuse Zone 7, Abuja. Telephone numbers: Switchboard: 09 524 0995-6 DG's Office: 09 524 1461 DG's Office Fax: 09 524 0994 Email: nafdacdg@ nafdacnigeria.org, nafdac@yahoo.com	Kano state office Federal Secretariat, Rooms 801,804 & 807, Katsina Road, Kano. Tel: 064-647538	Kebbi state office Malaria Control Unit, Beside Sir Yahaya Memorial Hospital, P. M. B. 1131, Birnin Kebbi. Tel: 068-322888
Abia special zone No 7 Ojike Lane, Aba, Abia State. Tel: 082-446007.	Katsina state office I.B.B. Way, opposite NEPA office, P. M. B. 2015, Katsina	Akwa-Ibom state office 1, Aka Illiam road P. O. Box 1148, Uyo. Tel: 085-202523
Adamawa state office Room 057 /058, Federal secretariat P.M.B. 2080, Yola. Tel: 075-626585.	Kogi state office Lokongoma phase I, By Pacific Hotel, Road, Lokoja.	Bauchi state office Federal Secretariat, Room 022/027 Nasarawa Road, P.M.B. 0104, Bauchi. Tel: 077-543229

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Benue state office No. 2 off Lokoja Street opposite Ministry of Justice, P. M. B. 102316 Makurdi, Tel.: 044-532852	Niger state office Federal secretariat, P. M. B. 102, Minna. Tel: 066-224259	Borno state office (A) North east zonal office Federal Secretariat, Room 3050 & 3051, P.M.B. 1363, Maiduguri, Tel: 076-230550 (B) Inspectorate office Federal Secretariat, Room 3050 & 3051, PB. 1363, Maiduguri, Tel.: 076-235567 (C) Maiduguri area Laboratory Biu road, Maiduguri secretariat, Maiduguri. Tel: 076-232664, 235567

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- Standards Organisation of Nigeria (SON) Website; www.sononlineng.org © 2003
- UK Food Standards Agency, http://www.food.gov.uk

Appendices

Test methods for analysis

Appendix A

Determination of moisture content

A.1 Apparatus

A.1.1 Analytical balance

A.1.2 Metal dish

This is noncorrosible under the test conditions, or failing this, a glass dish with a sufficiently tight-fitting lid, and having an effective surface area enabling the test portion to be distributed so as to give a mass per unit area of not more than 0.3 g/cm^3 .

A.1.3 Constant temperature oven

This is an electrically heated oven controlled in such a way that, during normal working, the temperature of the air and of shelves carrying the test portions is within the range 100 to 105 °C for four hours in the neighbourhood of the test portions.

A.1.4 Desiccator: Containing an effective desiccant

A.2 Procedure

A.2.1 Test Portion

Weigh 5 g quantity of the test sample in the dish, previously dried and tarred, together with its lid, to the nearest 1 mg.

A.2.2 Drying

Place the oven dish, containing the test portion together with the lid, in the oven and leave for 2 hours from the moment when the oven temperature is between 100 and 105 $^{\circ}$ C.

Rapidly take the dish out of the oven, cover it, and place it in the desiccator (1.4) when several tests are being carried out simultaneously, never place dishes on top of one another in the desiccator.

When the dish has cooled to laboratory temperature (generally between 30 and 45 min. after it has been placed in the desiccator), weigh it to the nearest 1 mg.

A.2.3 Number of determinations

Carry out two determinations on test portions taken from different test samples but from same laboratory sample.

A.3 Expression of results

The moisture contents expressed as a percentage by mass of the product as received, is given by the following formula:

m₀ = is the mass, in grams, of the test portion before drying.

m₁ = is the mass, in grams, of the test portion after drying.

A.3.1. Reproducibility

The difference between the values obtained from the two determinations carried out simultaneously or in rapid succession by the same analyst shall not exceed 0.15 g of moisture per 100 g of sample. If it does so the determinations shall be repeated.

A.4 Note on procedure

A.4.1 Precaution

Never place moist products in an oven containing test portion at the end of drying, as this could lead to partial rehydration of the latter.

Appendix B

Determination of total acidity (water extract method)

Shake 18 g of the sample with 200 ml of CO_2 -free water in a conical flask and place in a water bath at about 40 °C for 1 hr. (with the flask loosely stoppered). Filter and titrate 100 ml of the clear filtrate with 0.05 M NaOH solution with phenolphthalein indicator. The acidity of the water extracts increases during storage. 1 ml of 0.1 M NaOH = 0.009 g $CH_2H_6O_3$ (Lactic acid).

Appendix C

Determination of starch content (by difference)

On determination of the following: protein, ash, and fiber, the starch content is obtained by subtracting the total percentage of the abovementioned parameters from 100 percent of the sample. % Starch = [100 - (% Protein + % Ash + % Fiber)]

Appendix D

Determination of fiber (Ruwe Celeste method)

D.1 Principle

The sample is boiled first with dilute H_2SO_4 and then dilute NaOH afterwards. The residue is washed dried and incinerated in the muffle furnace.

D.2	Apparatus
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(i) Muffle furnace

(ii) Gooch crucible with sintered bottom or ashless filter paper.

D.3 Reagent

0.3M HCl; 0.15M H,SO4 1.5M NaOH; Acetone

D.4 Procedure

Weigh 1 g of sample into a conical flask and add 50 ml of $0.15M H_2SO_r$. Boil for 30 minutes in $0.15M H_2SO_4$ under reflux. Add 25 ml 1.5M NaOH, boil for 30 minutes filter and through Gooch crucible under pressure. Wash 5 times with hot water then once with 50 mL of 0.15M HCl, five times with water, then finally with 50 ml acetone.

Dry the crucible for 1hr at 140 °C. Cool in the desiccator and weigh. Incinerate for 1hr at 700 °C and weight after cooling in the desiccator. The difference between the two weighings in grams multiplied by 100 is the percent crude fiber.

Appendix E

Determination of sulphated ash

Ash is the residue obtained after incineration at 500 ± 10 °C under the conditions described.

E.1 Apparatus

E.1.1 Ash dish

Preferably of platinum or any other material which is unaffected under the experimental conditions of at least 20 ml capacity, flat-bottomed and with at least 15 cm² of surfaces (for instance, diameter 50 to 55 mm and height 15 to 20 mm). Clean the ashing dish, whether new or previously used, for instance with boiling dilute hydrochloric acid, then rinse with plenty of tap water and subsequently with distilled water.

Immediately before use, heat the dish in the furnace. Cool to room temperature in a cooling device and weigh to the nearest 0.001 g.

E.1.2 Electric heater or gas burner

E.1.3 Electric furnace

With adequate air circulation, provided with temperature control and a refractory coating, which is not liable or lose particles at ashing temperature.

E.1.4. Cooling device

Preventing moisture uptake (for example a desiccator with an international diameter of about 180 mm, provided with a perforated metal or porcelain plate and provided with an effective desiccant (for example, silica gel with a moisture indicator) (colored blue when dry or phosphorus pentaoxide)

- E.1.5 Glass rods: with one end flattened
- E.1.6 Analytical balance
- E.1.7 Heater: Resistance smooth plate (for example asbestos)
- E.2 Procedure

E.2.1 Requirement

Not more than 0.6% when determined as follows:

Heat a platinum dish to redness for 10 minutes; allow to cool in a desiccator and weigh.

E.2.2 Ashing

Place 1 g of the starch being examined in the dish, moisten with concentrated sulphuric acid, ignite gently, again moisten with concentrated sulphuric acid and ignite at about 800 °C. Cool, weigh again, ignite for 15 minutes and repeat this procedure until two successive weighing do not differ by more than 0.5 mg.

Appendix F

Hydrocyanic acid determination

F.1 Preparation of reagents

F.1.1 Preparation of bis-3-methyl-1-phenyl-5-pyrasolene

Gently reflux 1 mole ethylacetate with 3-mole phenythydrazine for less than half hour. The mixture will suddenly solidify. Remove immediately from heat. The solid bipyrasolene is boiled with alcohol three times. Prepare a stock pyrasolene powder by taking 1 part bipyrasolene to 5 parts 3-methyl-1-phenyl-5-pyrasolene.

F.1.2 Pyridine - Pyrasolene reagent

Dissolve 150 mg pyrasolene powder in 25 ml pyridine. Keep in refrigerator (max. 1 week) H.1.1 linamarase enzyme solution: Prepare a stock solution in 0.1M sodium phosphate buffer to obtain a final concentration of 2.5 microgram linamarin in 0.1M aliquot.

F.1.3 Standard KCN

Dry a small amount (10 mg) of cyanide above concentrated H_2SO_4 . Prepare standard solution by accurately weighing the substance and dissolve in distilled water in volumetric flask. Make further dilutions in volumetric glassware.

Note: KCN is highly poisonous, handle with greatest care.

F.2 Extraction

F.2.1 Apparatus

Warring blender Buchner funnel Screw cap bottle Glass fiber Refrigerator

F.2.2 Reagents

1mL - o-phosphoric acid

F.2.3 Procedure

1 g is extracted with 10 ml 0.1M phosphoric acid at top speed for 5 minutes. The slurry obtained is filtered through a layer of glass filter placed in Buckner funnel.

The homogeniser jar is rinsed with 50 ml acid and filtered in the same way. The filtrate is transferred to a screw-cap bottle and stored at $4 \,^{\circ}$ C in a refrigerator.

Appendix G

Determination of crude protein (Kjeldahl Method)

- G.1 Apparatus
- (a) Protein analyzer equipment comprising :
- (i) heating lower layer or digestion;
- (ii) Upper heating layer of distillation equipment
- (b) Kjehdal digestion flask

G.2 Reagents

Conc. Sulphuric Acid 50% Caustic Soda Boric Acid Indicator 0.05M Sulphuric Acid Protein Digestion Catalyst OrthoPhosphoric Acid Hydrogen Peroxide Methyl Red Indicator Potassium Sulphate Gooper-Selenium Catalyst (32 g K,SO4 + 8g CuSO4 + 0.136 g NaSeO3)

G.3 Principle

The principle is that the sample is digested with concentrated sulphuric acid to break down the organic substances into its components. The sample containing organic nitrogen, during digestion is converted to ammonium ions. The ammoniacal is distilled over into boric acid indicator. The ammoniacal distillate is titrated against 0.05M and the protein or nitrogen content derived by calculation using protein factor. The result is expressed in percentage.

G.4 Procedure

Preheat the block digestor for 40 minutes before the temperature s raised to 370-420 °C.

Transfer weighed homogenized sample on a filter paper, to a digestion tube taking an amount calculated to provide a titration of about 25mL of 0.5M H,SO, or a maximum weight of 2.0 g. Add one catalyst tablet and a further 1 g Potassium Sulphate (K,SO). Add 10 mL digestion acid (95% conc. H,SO, 5% orthophosphoric acid) by tip measure and mix by swirling gently. Add 10 ml hydrogen peroxide; make the volume up to 100 and mix. Leave for a few minutes. Place the tube in the heated digestor and attach the venting tube which removes the acid vapours. Allow digestion to proceed for 45 minutes. Remove the tube from the block digestor and allow to cool for 5 minutes on the metal rack. Add 75 ml demineralized water and mix. Place 25 ml boric acid solution (4%) in a titration receiver flask and place it on the distillation unit. Attach the tube containing the digested sample to the distillation unit and press the start button to effect a metered addition of NaOH solution and to initiate the steam distillation. When the receiver platform falls and the distillation stops, remove the flask, add 5 drops of screened methyl red indicator, and titrate with 0.05M H,SO, solution to grey endpoint. Carry out a blank K determination.

 $0.05M H_2SO_4 = 0.0014g N$

G.5 Calculation
% Protein = Titre value x 0.14 x 6.25
Weight of Sample

Appendix H

Determination of fat content

H.1 Procedure

Accurately weight about 5 g of sample into a round bottom flask, add about 50 ml of 0.3M *HCl* and digest the sample in this medium for about 30 minutes. Filter the mixture and spread out to dry. Transfer the dried residue into a thimble and extract the fatty matter with ether of boiling point 60–80 °C. Boil off the ether, dry, and weigh the resulting fat.



The Integrated Cassava Project (ICP) is made up of two complementary special projects: the Preemptive Management of Cassava Mosaic Disease Project (CMD) and the Cassava Enterprise Development Project (CEDP) both implemented by the International Institute of Tropical Agriculture (IITA). While CMD primarily looks at mitigating the impact of cassava mosaic disease and increasing productivity in Nigeria, CEDP focuses on utilization and the development of agribusiness.

ICP has three main aims: to sustainably increase food availability, reduce rural poverty and unemployment, and enhance agroindustrial and socioeconomic growth in Nigeria. This will be achieved by deploying high yielding resistant cultivars, adapting improved and profitable postharvest processing methods, and facilitating policies to ensure that problems along the commodity chain are reduced. ICP aims also to increase private sector investment in production, processing, storage, and marketing. The result will be that incomes are raised, and the livelihood of millions of poor farmers and rural processors will be improved.

ICP is funded by the Federal Government of Nigeria, the Niger Delta Development Commission, Shell Petroleum Development Company of Nigeria, the United States Agency for International Development, and state governments in southern Nigeria.

About IITA

The International Institute of Tropical Agriculture (IITA) was founded in 1967 as an international agricultural research institute with a mandate for improving food production in the humid tropics and to develop sustainable production systems. It became the first African link in the worldwide network of agricultural research centers known as the Consultative Group on International Agricultural Research (CGIAR), formed in 1971.

IITA's mission is to enhance the food security, income, and well-being of resource-poor people primarily in the humid and subhumid zones of sub-Saharan Africa, by conducting research and related activities to increase agricultural production, improve food systems, and sustainably manage natural resources, in partnership with national and international stakeholders. To this end, IITA conducts research, germplasm conservation, training, and information exchange activities in partnership with regional bodies and national programs including universities, NGOs, and the private sector. The research agenda addresses crop improvement, plant health, and resource and crop management within a food systems framework and is targeted at the identified needs of three major agroecological zones: the savannas, the humid forests, and the midaltitudes. Research focuses on smallholder cropping and postharvest systems and on the following food crops: cassava, cowpea, maize, plantain and banana, soybean, and yam.

About SON

The Standards Organization of Nigeria (SON) established through act No. 56 of 1971 is the apex statutory government body in Nigeria vested with the responsibility of carrying out standardization, quality assurance, and related activities. SON's mission is to build a flexible organization that can respond rapidly and effectively to technological innovations through standardization and quality assurance in order to meet the needs of our stakeholders and other interested partners.