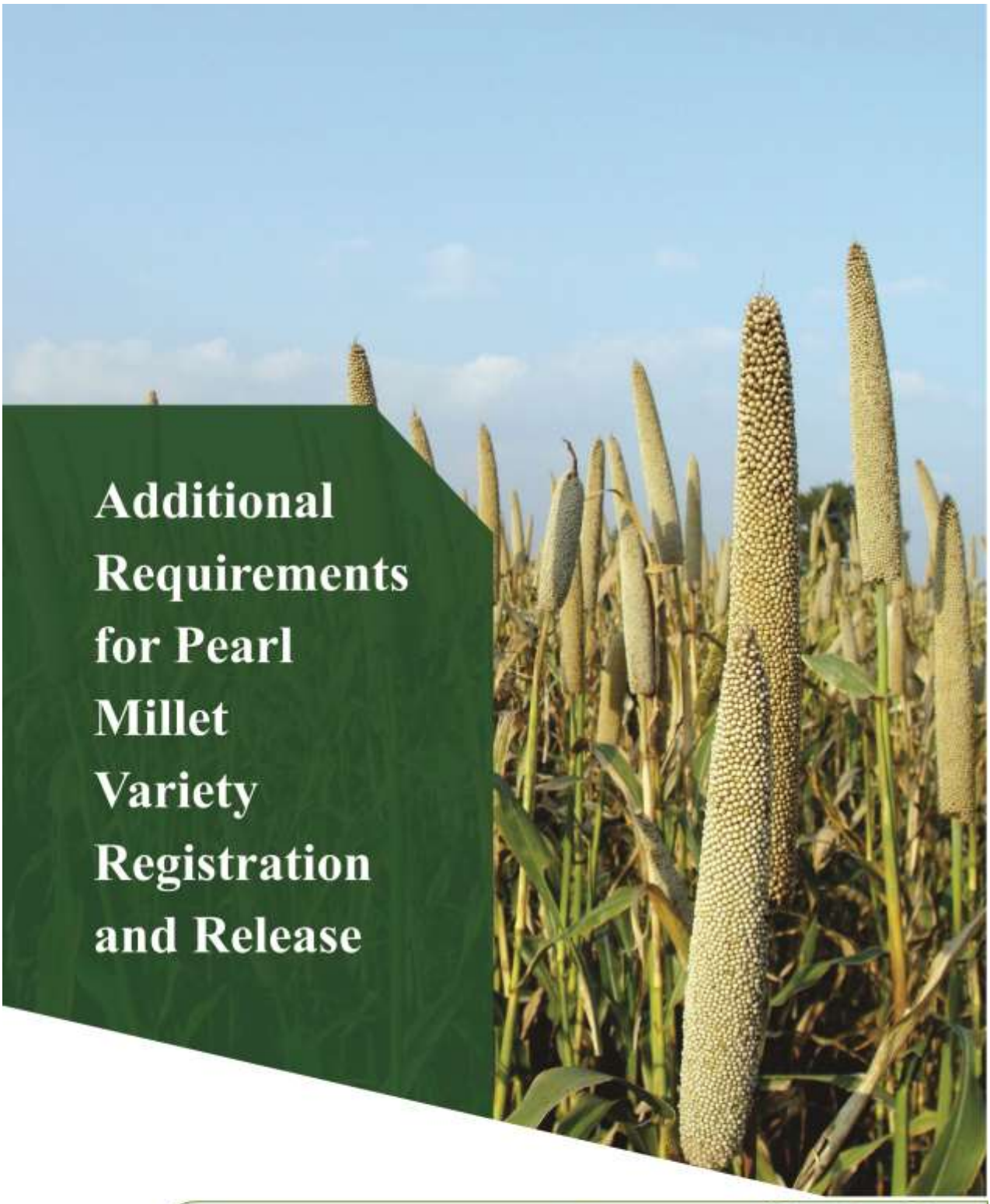
Additional Requirements for Pearl Millet Variety Registration and Release



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ADDITIONAL REQUIREMENTS FOR PEARL MILLET VARIETY REGISTRATION AND RELEASE

NIGERIA

In order to match with technological development and to keep continuous progress in industries, standards are subject to periodic review. Users shall ascertain that they are in possession of the latest edition.

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Acknowledgements

We would like to express our sincere gratitude to all the esteemed organizations that participated in the workshop for Pearl millet variety release and other specifications, held in Abuja. Your valuable contributions and collaborative spirits were instrumental in shaping the standards for Pearl millet varieties especially for National and International trade purposes.

We extend our special thanks to HarvestPlus – Nigeria, for bringing together key stakeholders and fostering productive discussions. We are also grateful to the Federal Ministry of Agriculture and Food Security (FMAFS) for their support and engagement. We acknowledge the invaluable expertise and research insights provided by International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and Lake Chad Research Institute (LCRI). We also appreciate the participation of the millet breeders, whose knowledge and dedication were crucial to the discussions. Furthermore, we recognize the significant contributions of Nigerian Institute of Food Science and Technology (NIFST), National Agency for Food and Drug Administration and Control (NAFDAC), Standards Organization of Nigeria (SON), National Centre for Genetic Resources and Biotechnology (NACGRAB), the National Varietal Release Secretariat, Unique Analytical & Diagnostic Laboratory Services Ltd, Genetics Society of Nigeria (GSN), National Agricultural Seeds Council (NASC), Agricultural Research Council of Nigeria (ARCN), National Root Crops Research Institute (NRCRI), Umudike, Institute for Agricultural Research, Samaru (IAR), Seed Entrepreneurs Association of Nigeria (SEEDAN), and Federal Ministry of Science, Innovation and Technology (FMIST). Their diverse perspectives on food safety, quality, regulatory frameworks, and testing were essential in establishing robust standards.

Finally, we thank Alliance of Bioversity International (CIAT) for their focus on biodiversity and sustainable agriculture, which aligns perfectly with our goals for the future of millet production, processing and trade in Nigeria. To each and every organization that participated, we express our sincere appreciation for your time, expertise, and commitment to advancing Pearl millet production in Nigeria. Together, we can ensure food security, improved nutrition, and sustainable livelihoods for all.

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LIST OF ABBREVIATIONS/ACRONYMS

- ABU – Ahmadu Bello University, Zaria
- ARCN – Agricultural Research Council of Nigeria
- AOAC – Association of Official Agricultural Chemists (AOAC International)
- CAGR - Compound Annual Growth Rate
- CIAT- The Alliance of Bioversity International and the International Center for Tropical Agriculture
- CODEX – CODEX Alimentarius Commissions
- EAS- East African Standards
- Fe – Iron
- FMAFS – Federal Ministry of Agriculture and Food Security
- FMISTI – Federal Ministry of Science, Innovation and Technology
- GSN – Genetics Society of Nigeria
- IAR – Institute for Agricultural Research, Samaru
- ICRISAT – International Crops Research Institute for the Semi-Arid Tropics
- IFPRI – International Food Policy Research Institute
- ISO – International Organization for Standardization
- Kg – Kilograms
- LCRI – Lake Chad Research Institute
- NACGRAB – National Centre for Genetic Resources and Biotechnology
- NAFDAC – National Agency for Food and Drugs Administration and Control
- NCRRCVLBF – National Committee on Registration and Release of Crop Varieties, Livestock Breeds and Fisheries
- NGMVS – Nigeria Millet Varieties Standards
- NRCRI – National Roots Crops Research Institute
- NASC – National Agricultural Seeds Council
- ppm – parts per million
- SEEDAN – Seed Entrepreneurs Association of Nigeria
- SON – Standards Organization of Nigeria
- UNECE – United Nations Economic Commission for Europe
- USA – United States of America
- Zn – Zinc

1. Introduction

Overview of Millet Production in Nigeria

Millet production is high in the north east and north west parts of Nigeria because of the good weather conditions and abundance of farmlands, available millet farmers as well as labour. The global millet market size is predicted to garner $551,469.70 thousand in the 2021–2028 time-frame, growing from $350,000.00 thousand in 2020, at a healthy compound annual growth rate (CAGR) of six percent (6%). The growing inclination of the urban population towards healthy food coupled with the increasing unsustainable rice and wheat production will drive millet products demand during the forecast period.

Nigeria is the third largest millet producing country in the world after India and China, and the leading producer in Africa followed Niger Republic and Mali. The areas of production in Nigeria are: Kaduna, Yobe, Kano, Jigawa, Katsina, Zamfara, Sokoto, Kebbi and Borno States. In 2023, the production of millet in Nigeria was estimated to be two million metric tons. Between 2005 and 2023, the millet output in the country reached its peak in 2008, with some nine million metric tons, then it followed a decreasing trend. The largest drop in production was registered in 2011 when the crop volume experienced a decrease of over 75 percent compared to 2010 (Statistia.com, 2023).

The two major types of millets cultivated mostly in Nigeria are Pearl millet (*Pennisetum glaucum*) and Finger millet (*Eleusine coracana*). Pearl millet is the most widely grown millet variety in Nigeria, especially in the northern states. It is well-suited to the hot and dry conditions of the Sahel region and has good drought tolerance. Finger millet, although less commonly grown, is still cultivated in some parts of Nigeria, particularly in the central and southern regions. Millet farming in Nigeria has faced numerous challenges over the years such as erratic rainfall patterns, land degradation, pests, and diseases. Additionally, the increased adoption of cash crops and the introduction of modern farming practices have led to a decline in millet cultivation. The actual average yield of millet under local conditions in Nigeria is 1.6 tonnes per hectare compared with a potential yield of 5.4 tonnes per hectare indicating a yield gap of 238% (Etonihu *et al.*, 2013; Food and Agriculture Organization Statistics, FAOSTAT, 2018)

In 2023, the national variety release committee released three new varieties which are:

- Pearl millet variety LCIC MV5 released based on high Iron and Zinc contents.
- Pearl millet variety LCIC MV6 released based on high yield.
- Pearl millet variety LCIC MV7 released based on high yield and presence of long bristles on panicle.

HarvestPlus in collaboration with the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and the Lake Chad Research Institute (LCRI) have produced two iron-rich millet varieties (known as Jirani and Chakti), becoming the first biofortified varieties of Pearl millet to be released in Africa.

This standard is for requirements for variety release as it concerns the development of regular and biofortified Pearl millet varieties in Nigeria.

This standard has therefore been developed to take into account:

- the needs for continuous improvement through breeding of the product;
- the need to prevent technical barriers to innovations by establishing a common breeding language for breeders. This will in turn facilitate fair domestic, regional and international development and research opportunities.
- the structure of the ISO, CODEX, UNECE, USA, and other internationally significant standards;
- the needs of the breeders to conform to standards; and
- the need for the National Committee on Registration and Release of Crop Varieties, Livestock Breeds and Fisheries (NCRRCVLBF) to certify, through a simplified form, that the variety is fit for commercialization and has the minimum micronutrient requirements for healthy living.

1. Millet seeds specification

a. Scope

This Nigeria Standard specifies the requirements for Pearl millet (*Pennisetum glaucum* (L.) R.Br.) intended for variety release.

b. Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies:

i. *AOAC 999.10 —Determination of Lead, Cadmium, Zinc, Copper, and iron in foods. Atomic absorption spectrophotometry after microwave digestion*

ii. EAS 38, *Labelling of pre-packaged foods — Specification*

iii. *CODEX Stan 193, Codex general Standards for contaminants and toxins in Food and Feed*

iv. ISO 520, Cereals and pulses — Determination of the mass of 1000 seeds

3. Terms and Definitions

For the purpose of this document, the following definitions shall apply;

3.1 **Millet seeds**: the whole or decorticated seeds of the species *Pennisetum glaucum* (L.) R.Br.

3.2 **Whole seeds**: seeds of millet obtained after proper threshing and winnowing

3.3 **decorticated seeds**: seeds of millet from which the outer parts have been removed in an appropriate manner using mechanical treatment (for example abrasion).

3.4 **foreign matter**: all organic and inorganic material other than millet, broken kernels, other seeds and filth. Foreign matter includes loose millet seed coats.

3.5 **other edible seeds**: any edible seeds (including oil seeds) other than the one which is under consideration

3.6 **damaged seeds**: seeds that are broken, sprouted or damaged as a result of heat, microbe, moisture or weather

3.7 **immature and shriveled seeds:** seeds that are not properly developed

3.8 **weevilled seeds:** seeds that are partially or wholly bored by insects injurious to seeds but does not include germ eaten seeds and egg spotted seeds

3.9 **poisonous, toxic and/or harmful seeds:** any seed which if present in quantities above permissible limit may have damaging or dangerous effect on health, organoleptic properties or technological performance such as Jimson weed — Datura (D. *fastuosa Linn.* and D. *stramonium Linn*.) corn cokle (*Agrostemma githago L., Machai Lallium remulenum Linn*.) Akra (Vicia species), *Argemone mexicana*, Khesari and other seeds that are commonly recognized as harmful to health.

2. Quality requirements

4.1 General requirements

1. The millet shall meet the following general requirements/limits as determined using the relevant standards listed in Table 1.1 as well as:

a) be the dried mature seeds of *Pennisetum (glaucum) americanum* Linn;

b) be hard, clean, wholesome, uniform in size and colour;

c) be safe and suitable for human consumption;

d) be free from abnormal flavours, obnoxious smell and discolouration;

e) be free from micro-organisms and substances originating from micro-organisms or other poisonous or deleterious substances in amounts that may constitute a hazard to human health;

f) be in form of well-filled seeds of uniform colour.

4.2 Specific requirements

Millet shall be considered for variety release on the basis of the minimum limits established in Table 1 which shall be additional to the general requirements set out in this standard.

Table 1 — Specific requirements for millet varieties

Table 1.1. Micronutrient requirements

S/N	Parameter	Regular Pearl Millet	Biofortified Pearl Millet	Test Method
1	Iron (Fe)	≥45$_{ppm}$	≥60$_{ppm}$	AOAC 999.10
2.	Zinc (Zn)	≥30$_{ppm}$	≥35$_{ppm}$	
3.	Calcium (Ca)	≥30 ppm		

Table 1.2. Requirements for other parameters

S/N	Parameter	Value	Test Method
1.	Carbohydrates	≥ 62%	ISO 5527:2015
2.	Fats	≥ 2%	
3.	Proteins	≥ 8%	
4.	Yield	≥ 2.5 tons/ha except for specific purposes	tons/ha
5.	1000 Seed weight	≥ 10g	ISO 520
6.	Seed size	≥ 3mm	ISO 605
7.	Seed colour	Specify	Physical colour chart

3. Packaging

a. The millet seeds shall be packed in suitable packages which shall be clean, sound, free from insect infestation, fungal infection and the packing material shall be of food grade quality;

b. The millet seeds shall be packed in containers which will safeguard the hygienic, nutritional, and organoleptic qualities of the products;

c. The containers, including packaging material, shall be made of substances which are safe and suitable for their intended use. They shall not impart any toxic substance or undesirable odour or flavor to the product;

d. Each package shall contain the millet seeds of the same type and of the same grade designation;

e. If the millet seeds are presented in bags, the bags shall also be free of pests and contaminants;

f. Each package shall be securely closed and sealed.

4. Annex

6.1 List of Contributors

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