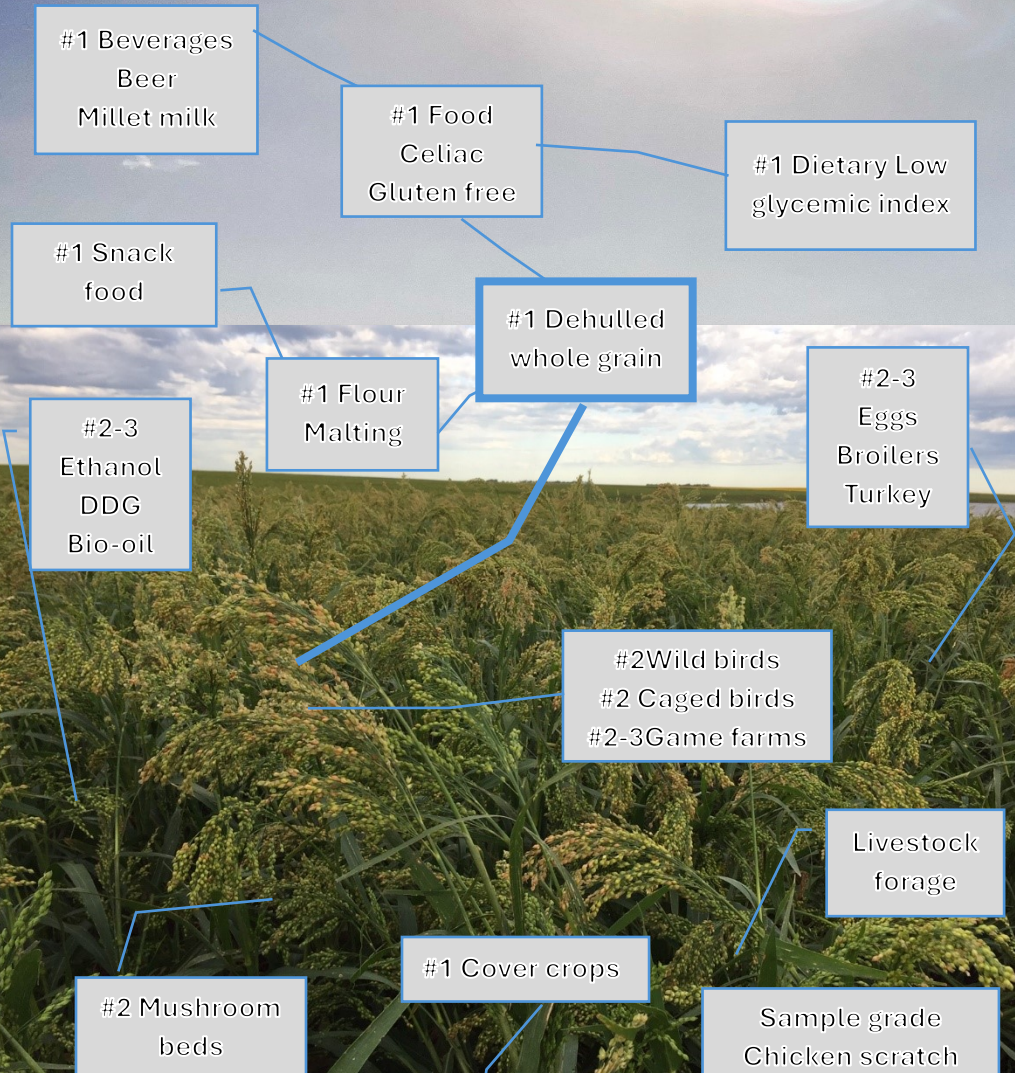


North American Millets Alliance presents:

Ancient Proso Millet

Quality Grading Standards

Versatile Survival Grain



Efficient nutrient utilization

Extremely drought tolerant

Proso Millet

(*Panicum miliaceum*)

Grain Standards

for farmers, buyers, processors, manufacturers and exporters.

(Currently, these have not completed regulatory review by
USDA's Agricultural Marketing Service.)

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Definitions

Definition of proso millet grain.

Grain from proso millet (*Panicum miliaceum L.*) shall be defined as any grain which, before the removal of dockage, consists of 50 percent or more of proso millet seed and not more than ten percent of other grains for which standards have been established under the United States Grain Standards Act.

Principles Governing Application of Standards

Distinctly low quality. The determination of distinctly low quality is made on the basis of the lot as a whole at the time of sampling when a condition exists that may or may not appear in the representative sample and/or the sample as a whole.

Damaged kernels. Pieces of proso millet kernels and other grain that are badly ground damaged, badly weather-damaged, diseased, frost-damaged, germ-damaged, heat damaged, insect bored, mold-damaged, sprout-damaged, or otherwise materially damaged.

Defects. Damaged kernels, foreign material, and shrunken and broken kernels. The sum of these three factors may not exceed the limit for the factor defects for each numerical grade.

Dockage. All matter other than proso millet that can be removed from the original sample by use of an approved device according to procedures prescribed in Federal Grain Inspection Service instructions. Also, underdeveloped, shriveled, detached proso millet hulls, and small pieces of proso millet kernels removed in properly separating the material other than proso millet and that cannot be recovered by properly rescreening or recleaning is considered dockage.

Foreign material. All matter other than proso millet that remains in the sample after the removal of dockage and shrunken and broken kernels.

Heat-damaged kernels. Kernels, pieces of proso millet kernels, and other grains that are materially discolored and

damaged by heat which remain in the sample after the removal of dockage and shrunken and broken kernels.

Infested. Infested proso millet contains live stored insects. Tolerances for live stored grain insects responsible for infested proso millet, barley, canola, corn, oats, sorghum, soybeans, sunflower seed, wheat, and mixed grain are defined according to sampling designations of the Federal Grain Inspection Service.

Other grains. Barley, corn, popcorn, sweet corn, cultivated buckwheat, wheat, einkorn, emmer, poulard wheat, Polish wheat, flaxseed, guar, hull-less barley, sorghum, nongrain sorghum, oats, rice, rye, safflower, soybeans, spelt, sunflower seed, triticale, wild oats, and other species of millet.

Certain quality determinations. Each determination of rodent pellets, bird droppings, other animal filth, broken glass, castor beans, cockleburrs, crotalaria seeds, dockage, garlic, live



insect infestation, large stones, moisture, temperature, an unknown foreign substance(s), and a commonly recognized harmful or toxic substance(s) is made on the basis of the sample as a whole. When a condition

exists that may not appear in the representative sample, the determination may be made on the basis of the lot as a whole at the time of sampling according to procedures prescribed in Federal Grain Inspection Service instructions.

Proso Millet Grades and Grade Requirements

Grades: Proso millet grain shall be graded and designated fungible according to the respective grade requirements of the numerical grades and sample grade of these standards and is to include only grain from varieties of *Panicum miliaceum L.*

Proso Millet Grain—Grade requirements

U.S. Grade	Minimum Test Weight per bushel (pounds)	Maximum Limits of Damage Grain and Dockage (percent)
No. 1	56	5
No. 2*	53	7
No. 3**	50	15
Sample	<50	>15

*Proso millet that is slightly weathered shall be graded not higher than U.S. No. 2.

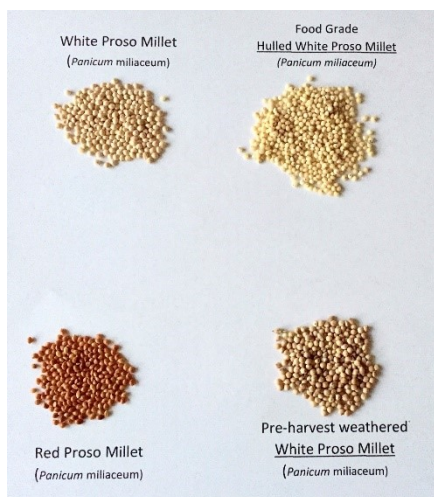
**Proso millet that is badly stained or materially weathered shall be graded not higher than U.S. No. 3.

Sample grade shall include proso millet grain which does not come within the requirements of either of the grades No. 1, No. 2, or No. 3, or which contains more than 15 percent moisture, or which is rancid, musty, sour, or heating or hot; or which has any commercially objectionable foreign odor, or which is otherwise of distinctly low quality as outlined below.

Special Grades and Grade Requirements

Smutty. Smutty proso millet shall be defined as millet which has the kernels covered with smut pores, or which contains smut masses in excess of two percent.

Grades of Smutty. Smutty proso millet shall be graded and designated according to the grade requirements of the standards applicable to such millet if it were not smutty, and there shall be added to and made a part of, the grade designation the word “Smutty.”



Basis of grade determinations. Each determination of test weight, moisture and damage shall be upon the basis of the grain after the removal of that part of the dockage which can be removed readily by the use of appropriate sieves and cleaning devices. All other determination shall be upon the basis of the grain as a whole.

Percentages. Percentages, except in the case of moisture, shall be percentage ascertained by weight.

Percentage of Moisture. The percentage of moisture shall be that ascertained by the air oven or ascertained by any device

and method which will give equivalent results in the determination of moisture.

Percentage of Dockage. Dockage shall be stated in terms of whole and tenth percent to the nearest tenth percent. The word “dockage” together with the percentage thereof, shall be added to the grade designation.

Quantity of Dockage. The quantity of dockage shall be calculated in terms of percentage based on the total weight of the millet including the dockage.

Test Weight per Bushel. Test weight per bushel shall be the weight per Winchester bushel or as determined by any device and method which will give equivalent results in the determination of test weight per bushel.

To assist grain inspectors in properly applying the grading factors prescribed in the official grades, the following procedure is prescribed:

1. Determinations. Determine whether the original sample contains 50 percent or more of a certain class of proso millet seed of the varieties of *Panicum miliaceum L.* and not more than ten percent of other grains for which standards have been established. If analysis is necessary, it shall be made on the representative portion of not less than 25 grams cut from the original sample using a Boerner divider.
2. Dockage. Dockage determination shall be based on a representative portion of the original sample of sufficient size to provide from 1 1/8 to 1 1/4 quarts of mechanically cleaned millet grain.

2.1. Mechanical Separation. Mechanical separation is important that a dockage tester with air blast such as the Carter Dockage Tester be used for the mechanical separation of dockage. It is almost impossible to detect the differences in appearance between empty hulls and well filled kernels in some samples. The air blast removes the empty hulls very efficiently. In using the Carter Dockage Tester, the combination of riddle and sieves should be used as follows:

2.1.1. Set air control at Number 3 ½.

2.1.2. Set feed control at Number 4.

2.1.3. Use Number 000 riddle.

2.1.4. Use Number 4 sieve in top sieve carriage.

2.1.5. Use Number 2 sieve in middle sieve carriage.

2.1.6. Use Number 7 sieve in bottom sieve carriage.

2.1.7. Put sample through tester once.

All material removed by air blast shall be considered as dockage. All material passing over the riddle shall be considered as dockage except unthreshed proso millet. In very exceptional samples a small amount of unthreshed millet may pass over the riddle. These unthreshed millet kernels should be considered as millet and returned to the sample. All materials passing over the top, middle, and bottom sieves shall be classed as mechanically cleaned millet. The material passing through the bottom sieve, although primarily dockage, will usually contain small kernels of millet and cracked millet which must be reclaimed by using the appropriate hand sieves.

For samples containing an appreciable amount of green (small) foxtail, or similar seeds or weeds, a 4/64th inch

round hole sieve should be used. Material passing through the 4/64th inch round hole sieve shall be classed as dockage.

For samples which do not contain foxtail millet, other millets, green or yellow foxtail, or other seeds of similar size, the 1/20th inch round hole sieve should be used. This sieve will permit reclamation of a greater proportion of cracked proso millet. Material passing through the 1/20th inch round sieve shall be classed as dockage.

3. Sample Grade Considerations:

3.1. Stones/Dirt. Stones or dirt are considered dockage.

More than seven stones, or hardened dirt clods in a representative sample which have an aggregate weight in excess of two percent of the sample weight are considered Sample Grade; or

3.2. Contamination. Sample Grade should be used if a representative sample has more than two pieces of glass, three or more crotalaria (*Crotalaria spp. L.*), two or more castor beans (*Ricinus communis L.*), four or more particles of an unknown foreign substance(s) or a commonly recognized harmful or toxic substance(s), eight or more cockleburs, or in combination, ten or more rodent pellets, bird droppings, or equivalent quality of other animal filth per 1 1/8 to 1 1/4 quart of proso millet; or

3.3. Dockage. Dockage exceeding fifteen percent is Sample Grade; or

3.4. Smell. Has musty, sour, garlicky, or commercially objectionable foreign order; or

- 3.5. Heat. Has heating or otherwise of distinctly low quality;
or
 - 3.6. Damage. Pieces of proso millet kernels and other grains materially damaged as defined in Application of Standards; or
 - 3.7. Foreign Material. Non-organic foreign material (rocks, dirt, metal, plastic, and other non-organic matter) may not exceed the limit of two percent for numerical grade or otherwise it is considered Sample Grade; or
 - 3.8. Insects. Live stored grain insects detected in a sample is considered Sample Grade.
-
4. Classes of Proso Millet. There are four classes (White, Red, Mixed, and Other), and two subclasses (Regular and Glutinous) of proso millet and must be harvested, transported and stored separately, and shall not have more than one seed per thousand of a different class, or one seed per hundred in a different subclass.
 - 4.1. White. White proso millet class shall have a white or creamy hull (pericarp).
 - 4.2. Red. Red proso millet class shall have a red or reddish brown hull (pericarp).
 - 4.3. Mixed. The class of Mixed Proso Millet is used when two or more hull (pericarp) colors are mixed.
 - 4.4. Other. Other proso millet class may have a yellow, gray, brown, black or other colored hull (pericarp) not listed above.



Further actions: Agricultural Marketing Service and U.S. Grain Standards

1. **USDA/AMS/FGIS--Program Handbook.** Grain Inspection Handbook—Book II, Grain Grading Procedures (last dated July 30, 2013) should be modified to contain Proso Millet Grain Grading Standards.
2. **U.S. Standards.** Modifications should be considered in the USDA/AMS/FGIS's Official United States Standards for Grain, Subpart A—General Provisions (last modified September 2007).



Proso Uses

Nutritious food with health advantages:

Low glycemic index & Gluten-free

Boil--as rice and quinoa substitute

Cereals—multi-grains, puffs

Breakfast—porridge, waffles, desserts (Kesari)

Snacks—crackers, puffs, flakes, protein bars

Breads (flour, kernel, sprouted)—flatbread, torillas, pancakes

Soups/thickener—creamy texture (cold & hot viscosity)

Waxy proso—cooked (99-100% sticky starch-variety specific)



Proso gluten-free drinks:

Millet milk—non-dairy vegan creamer

Proso beer—Taiwan, Europe, U.S.

Boza (fermented)—Romania, Bulgaria

Rakshi (fermented)—Nepal

Tongra (fermented)—India, Nepal

Suutei tea (roasted)—Mongolia



Animal uses:

Chickens—eggs

Chickens & turkey—meat (broilers)

Hogs—milled grain, open-range forage

Dairy & Beef—milled grain, forage, straw

Sheep—milled grain, forage, straw

Petfood—gluten free milled grain

Wild & caged birds—whole seed



Other uses:

Mushroom—spawning bed

Biofuels—Ethanol, biodiesel (oil), DDGS

Hulls—pillow filling

Climate Smart Proso

Water efficiency:

High grain to moisture ratio

C-4 crop—photosynthetic efficiency, water use efficiency

Dryland (drought tolerant) or limited irrigation

Crop rotations:

Not continuously cropped

Responds to low nutrients

Best in grass/legume (proso/wheat/soybean)

Double-crop (winter wheat/proso)

Fits regenerative cropping (no-tillage)

Low cost production



Geographic diversity (ancient grain):

Genetic diversity (>29,000 germplasm, 5 races, 6 continents)

Various ecotypes (DNA markers well established)

Resilient, adapted to many soil types, stress tolerant

Photo period sensitive (adjusts to day-length)

Short growing season (60-90 days)

Emergency crop—after frost, flood, hail

Quick moisture response

Moisture availability lengthens or shortens maturity

Fine shallow roots (tap unused nutrients/moisture)

Improves pest management (weeds, insects, disease)



Ground cover:

Post-harvest stubble--collects snow, wildlife & bird forage

Post-harvest straw (saves moisture, moderates soil temps)

Ground cover recycles nutrients, builds organic matter

Cover crops (blended with other seeds/grains)

Wind & water erosion control

Proso Availability

Production:

680,000,000 lbs/year (1999-2023)

20+ U.S. States produce proso annually

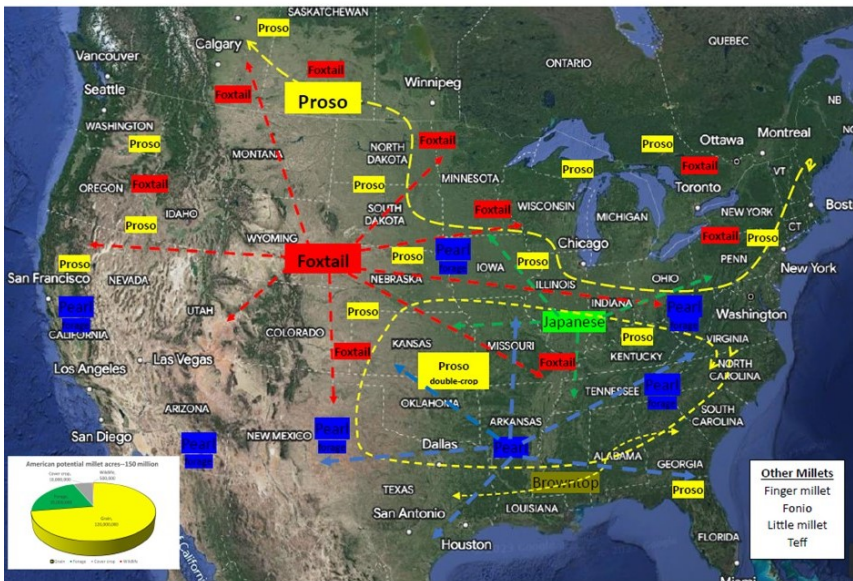
460,500 acres (in just 3 states—CO, NE, SD)

\$56,800,000 annual farm value

Shipping: truck, rail, water

Sources: farmers, grain elevators, traders

North American Millet Potential: 150 million acres



Source: Google Earth overlaid by Gary W. Wietrefre, wwwbooks@outlook.com, <https://www.RelativetoAncients.com/>

Proso potential:

Food—replacing wheat, rice, corn

Beverage—gluten-free drinks replacing barley & wheat

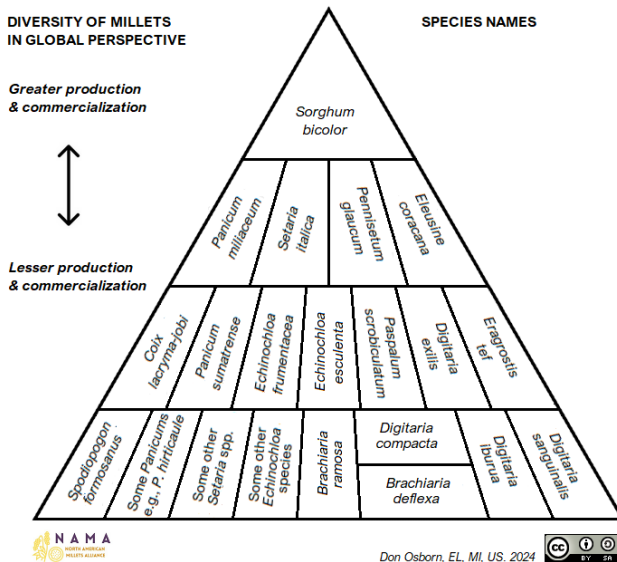
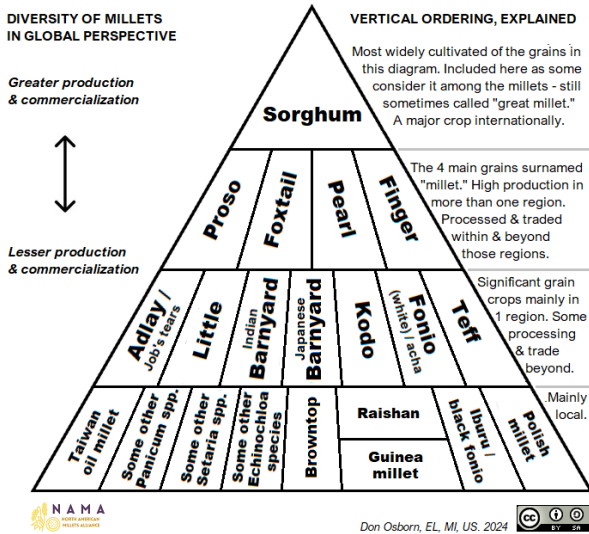
Feed—replacing corn for poultry

Biofuels—climate smart--replacing corn

A "Millets Triangle"

Visualizing millets as a group, with one re-usable schematic

Don Osborn, PhD



Millet Triangle YouTube: <https://www.youtube.com/@MilletsAlliance>

Further information:

North American Millets Alliance

Website: <https://milletsalliance.org/>

YouTube: <https://www.youtube.com/@MilletsAlliance>

LinkedIn: <https://www.linkedin.com/company/north-american-millets-alliance-nama/>

Facebook: www.facebook.com/groups/243364207975357/

Book: How to Produce Proso Millet: A Farmer's Guide

<https://www.researchgate.net/profile/Gary-Wietgreffe/research>

U.S. Production & Trade Statistics

NASS Statistics:

<https://quickstats.nass.usda.gov/results/1A8A1D72-7813-3C9C-ACCB-1C354FAF4C29>

USDA—FSA Production:

<https://www.fsa.usda.gov/tools/informational/freedom-information-act-foia/electronic-reading-room/frequently-requested/crop-acreage-data>

USDC—Census Trade:

<https://usatrade.census.gov/index.php?do=login>

Varietal research:

University of Nebraska:

<https://extensionpubs.unl.edu/publication/g2219/2013/pdf/view/g2219-2013.pdf>

Dryland Genetics: <https://www.drylandgenetics.com/>