

Economic and social impact of millets: International Year of Millets-2023

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Introduction:

Millet is a cereal crop plant belonging to the grass family, Graminae (FAO, 1972). The term "millet" is used loosely to refer to several types of small seeded annual grasses (FAO and ICRISAT, 1996), belonging to species under the five genera in the tribe *Paniceae*, namely *Panicum*, *Setaria*, *Echinochloa*, *Pennisetum* and *Paspalum*, and one genus, *Eleusine*, in the tribe *Chlorideae* (FAO, 1972). Most of the genera are widely distributed throughout the tropics and subtropics of the world (de Wet, 1987). The genus *Pennisetum* for example, includes about 140 species, some of which are domesticated and some are growing in the wilderness. Millets are small grained cereals, the smallest of which include kodo, foxtail, proso (commonmillet), little and barnyard millets (Rao, 1989). They are the staple food of the millions inhabiting the arid and semi-arid tropics of the world, and are distributed in most of the Asian and African countries and parts of Europe. According to Dendy (1995) the most important millets are **pearl millet** (*Pennisetum glaucum*), finger millet (*Eleusine coracona*), proso millet (*Panicum miliaceum*) and foxtail millet (*Setaria italica*). But according to FAO (1972) and Hulse *et al.*, (1980), the most important cultivated millet species are: pearl Millet (*Pennisetum typhoides*), also known as bulrush millet; proso millet (*Panicum miliaceum*), also known as common millet; foxtail millet (*Setaria italica*); Japanese barnyard millet (*Echinochloa crusgalli* var. *Frustrata* or *E. colona* (Sawa)); finger millet (*Eleusine coracona*) also known as birds food millet or African millet; and kodo millet of India (*Paspalum scorbiculatum*). Other millets include little millet (*Panicum sumatrense*), tef millet (*Eragrostis tef*) and Fonio millet (*Digitaria exilis* and *D. iburua*) (Dogget, 1989). The various types of millets, their food values and comparison are shown in Tables 1.

Economic and social impact of millets:

Millet, in most cases, have been grown in difficult conditions, and it is scarcely surprising that they involve high production risks (Dogget, 1989). They have always been crops for situation where there is a risk of famine, as well as offering a low but more reliable harvest relative to other crops. Although it is found in other countries, finger millet has gained little importance outside Africa and India. Equally important to note is that, common millet has received little attention from plant breeders (Hulse *et al.*, 1980). In most parts of the world, millet is grown as a subsistence crop for local consumption. Commercial millet production is risky, especially in Africa because the absence of large market outlets means that fluctuations in output cause significant price fluctuations, particularly in areas where millet is the main food crop (FAO and ICRISAT, 1996). Apart from grain production, millet is also cultivated for grazing, green fodder or silage.

World trade:

According to Spencer and Sivakumar (1987) world production of all millets is about 29 million tonnes, of which 35 percent is produced in Africa (Tables 5 and 6). This represents about one third of all the world millets, 70 percent of which is grown in West Africa. According to FAO and ICRISAT (1996), developing countries, mainly Asia and Africa, account for about 94 percent of global output of millet, estimated at some 28 million tonnes (according to the 1992-1994 average) (Table 7).

Table-1: World distribution of sorghum and major types of millets.

Scientific name	Common names	Cytogenic origin	Location grown
Sorghum bicolor	Sorghum, milo, jowar, kafir, Guinea-corn, cholam	Equatorial Africa	Worldwide, Africa, India, China, United States.
Pennisetum glaucum P. americanum P. typhoides	Pearl, bajra, cattail, burlush, Candlestick, sanyo, munga, seno	West Africa	Africa, India.
Eleusine coracana	Finger, ragi, African, bird's foot, rapoko, Hansa	Originated in Africa and domesticated in India	East and Central Africa, India, China.
Setaria italica	Foxtail, Italian, kangni, navane,	Eastern Asia	Asia (Russian Federation, China,

	German, Siberian, Hungarian		India, Japan) North Africa, Southeast Europe, Near East
<i>Panicum miliaceum</i>	Proso, Common, Hershey, Panivarigu, broomcorn, hog, Samai, Russian	China	Eastern Asia, Russian Federation, China, Mongolia, Middle East, Main millet in USA
<i>Echinochloa frumentacea</i> <i>E. crus-galli</i> <i>E. utilis</i>	Japanese, barnyard, sanwa, kweichou, kudiraivali, sawan, Korean	Java / Malaysia	East Asia, India, Egypt
<i>Paspalum scrobiculatum</i> <i>P. commersoni</i>	Kodo, varagu, bastard, ditch, naraka	Africa or India	India
<i>Eragrostis tef</i>	Tef	Ethiopia	East Africa (Ethiopia)
<i>Digitalia exilis</i> <i>D. iburua</i>	Fonio, fundi, hungry rice, acha, Crabgrass, raishan	Domesticated in Nigeria	West Africa (savanna)

Source: Saldivar and Rooney, 1995.

Primary products:

Traditional methods are usually applied to decorticate millet grains partially or completely before further processing and consumption. Whole grains may as well be directly dry-milled to give a range of products: broken or cracked grains, grits, coarse meal and fine flour. The flour thus obtained is used in the preparation of an extensive variety of simple to complex food products. They can also be mixed with other flours to form composite flours for soft and stiff porridges (Bangu *et al.*, 2000).

Secondary and derived products:

It is unusual, in any human society, for cereals to be eaten as uncooked whole seeds (Hulse *et al.*, 1980). For human food, the millet grains are customarily milled before being

cooked. Drymilling embraces a wide range of technologies from simple grinding of the whole seed between stones or in a pestle and mortar to the complex continuous system of precision rollers. Common millet (proso) contains a comparatively high percentage of indigestible fibre because the seeds are enclosed in the hulls, and difficult to remove by conventional milling processes (Matz, 1969 quoted by Hulse, *et al.*, 1980).

Traditional milling equipment:

Almost without exception, women do traditional milling and decorticating of millet. Munck (1995) reports that care is taken to prepare the milling products and cook them freshly every day, because keeping quality of flour is low in the tropics. However, flour may keep for some days (even up to two weeks after it has been prepared). The simplest type of processing is to grind the whole grain in a stone hand mill, a village stone mill, or a hammer mill driven by diesel engine. Moistened millet grains are pounded in mortar with a pestle to remove the pericarp (Figure-2). The decorticated grain is later crushed to grits, flour etc. In India, women use mortars made of stone and pestles made from wood to decorticate the millets. The stone mortar is sometimes fixed in the ground, and appears as a pit or hole in the ground. Millet grains require more time to pound than sorghum grains. Usually, an amount of grain less than 1kg is washed and placed in mortar, and moistened to soften the bran. Sorghum grains are pounded vigorously for 5 minutes, but millet grains may be pounded for a longer period. The bran obtained after pounding is washed, and the clean endosperm recovered is left for sun drying. The washes contain the bran and a major portion of the germ, which gets broken and removed from the kernel during the pounding process.

Improved milling equipment:

Some machines equipped with Carborundum stones are used to polish the grains. Decortication is sometimes accomplished by using rice dehullers or other abrasive dehullers. A hammer mill may be used for milling of millet into flour. The key raw material characters for grain milling quality are the size, form and structure of the seed, including the development of its outer (bran) layers and the endosperm hardness (Muck, 1995). Due to their small grain size, milling is often more complex with millet than it is with sorghum (Muck, 1995).

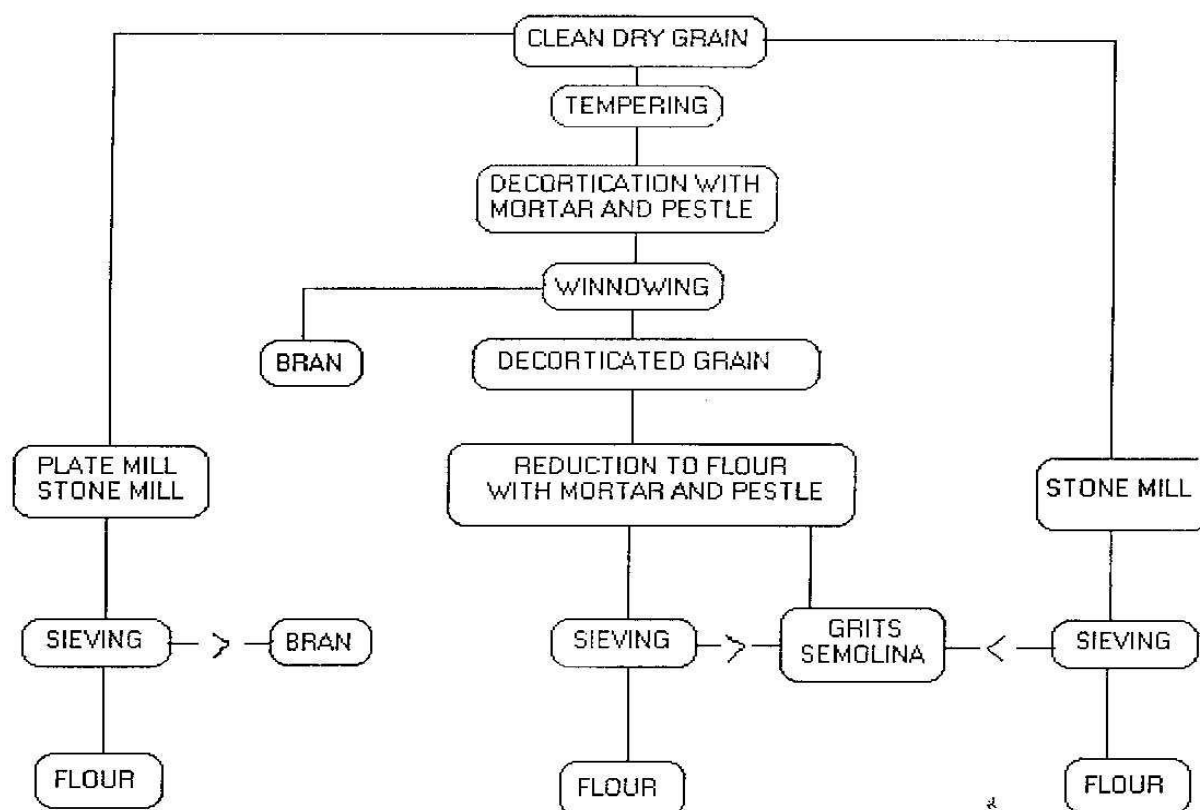


Figure-1: Flowchart for traditional milling methods of millets into flour.

Thick porridges:

The most common and simple food prepared from millets is porridge. Stiff (thick) porridges are consumed in almost all countries where sorghum and millets are cultivated (Murty and Kumar, 1995). Soft (thin) porridges are also a simple food product from millets. The basic difference between thick and thin porridges is the concentration of flour. Generally, thick porridges are solid, and can be eaten with the hand, while thin porridges are fluid and can be drunk from a cup, or eaten by a spoon. The preparation of stiff porridge entails adding flour to boiling water in increments accompanied by vigorous stirring. The flour is cooked until it forms a thick, homogeneous and well gelatinized mass devoid of lumps.

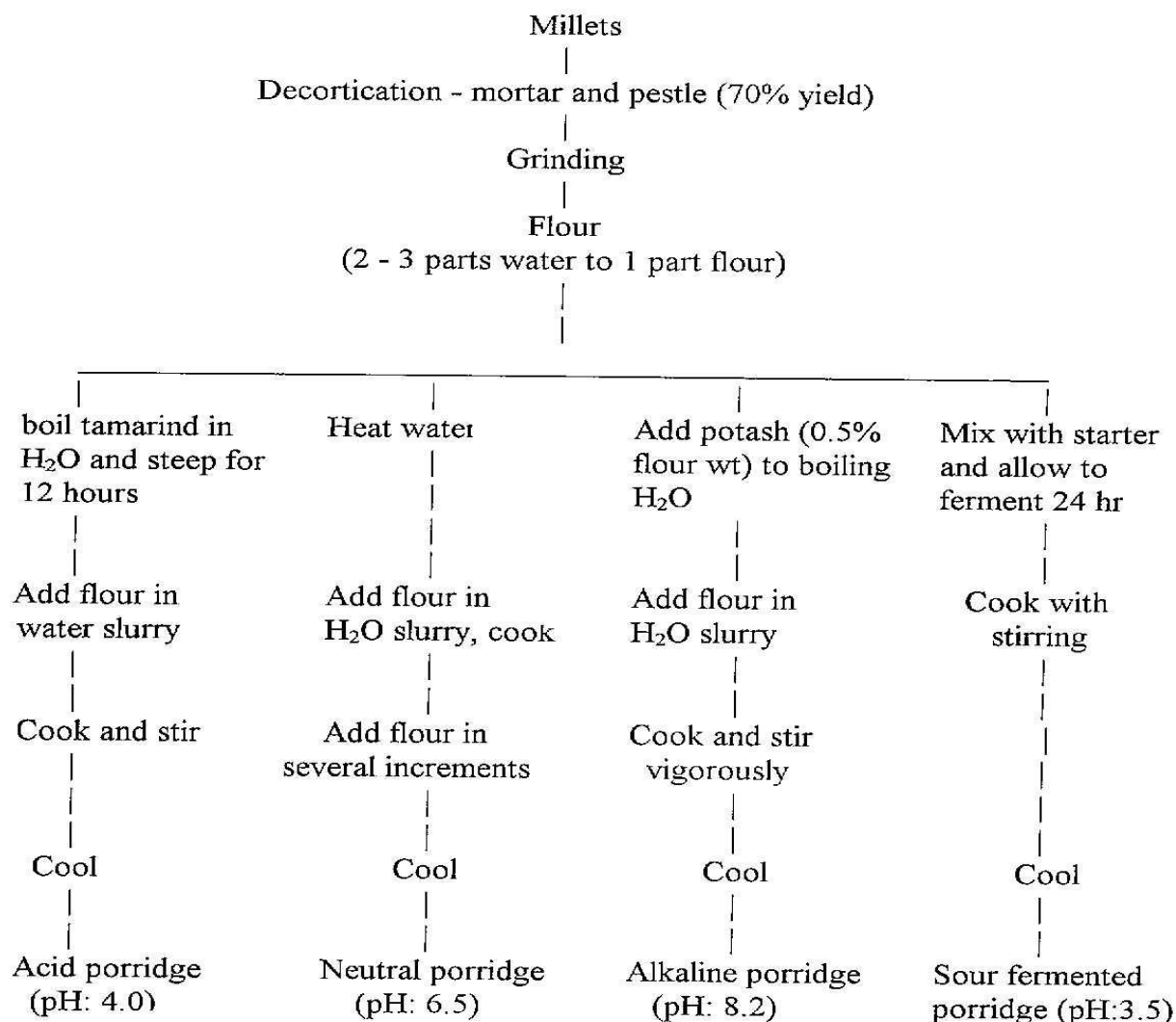


Figure-2: Flow chart for producing stiff porridge from millets.

Soft porridges:

Soft porridges (sometimes known as thin porridges) may be prepared from millet flour (or other flours) as fermented or unfermented food product (Marty and Kumar, 1995). They may be prepared from dry-milled flour, from whole de-hulled grains, soaked grains, and germinated or malted grains. Composite flours of millets, sorghum, rice, cassava etc may be used (Bangu *et al.*, 2000). A simple unfermented soft porridge, called *uji* in Tanzania, Kenya and Uganda, may be prepared by making a thick flour suspension and adding it to boiling water. The thin boiling solution is stirred with a ladle for about 5 minutes when complete gelatinization is achieved. The initial suspension of flour can be left aside overnight for fermentation and used next day to make a fermented *uji*. The purpose of fermentation is to

produce some acceptable flavours and mask the undesirable ones, as well improve storability. Much of the bulrush millet is made in to soft porridge, (*uji*), or into stiff porridge (*ugali*) (Acland, 1971; Kajuna, 1995).

Breads:

Fermented breads: In India, millet flours are fermented and used to make a wide range of pancakes (Murty and Kumar, 1995). Such traditional fermented breads as *injera*, *kisra*, *dosa*, *massa* and *galettes* do exist.

Injera:

Injera is a traditional cereal bread prepared from Tef millet, and is popular in Ethiopia. It can also be prepared from Finger millet. *Injera* preparation starts by fermenting the flour for about 48 hours. A fresh batch of flour is gelatinized by adding boiling water, and the gelatinized flour is added to the fermented batter to hasten secondary fermentation.

Dosa:

In Southern India and Sri Lanka, fermented batter is mixed with legume batter and baked into a thin pancake called *dosa*. Rice is preferable to other cereals, but millets may also be used. De-hulled millet grains are soaked, wet milled and fermented overnight. The batter is poured in small quantities onto a hot metal plate with some oil, and baked for about one minute. The resulting crispy but flexible 2-4 mm thick and 20-25 mm diameter pancake is called *dosa*, and is consumed with curd, vegetables, chillies or other sauces.

Massa and Galettes:

In West Africa, pancakes such as *massa* and *galettes* are prepared from millets and sorghum, but these are only consumed occasionally (Faure and Muchnik, 1989, quoted by Murty and Kumar, 1995).

Unfermented bread:

Roti: In India, an unfermented pancake, called *roti*, is produced from pearl millet, small millets, sorghum or maize flour. *Roti* is also known as chapati in other parts of India and East Africa, such as Tanzania. It can be consumed with vegetables, dal, meat, milk, curd, sour milk, pickles and other sauces. The preparation of *roti* entails taking about 50 g of flour, which is mixed with about 45 ml of warm water. The flour-water mixture is kneaded on a wooden board to obtain cohesive dough. The dough is made into a ball, which is pressed by a wooden rod

into a thin (about 1.3 to 3 mm thick) circular sheet, which is then baked for about one minute on an earthen or iron pan.

Beverages:

Malted millet grains have been widely used in Africa for centuries to make alcoholic and non-alcoholic fermented beverages (Murty and Kumar, 1995).

Alcoholic:

Two major kinds of beer are produced in millet consuming areas, namely (a) a soured alcoholic, effervescent, brown, viscous opaque beverage which is consumed while undergoing active fermentation, and (b) a sweet, relatively non-sour type of beer (Rooney and McDonough, 1987). The soured beer is made from malted millet or sorghum or both, and several different starch materials, e.g. corn grits are used as adjuncts. The traditional production of beer is an art, usually practised by women.

Non-alcoholic:

In Africa, several non-alcoholic beverages are prepared from millets (Murty and Kumar, 1995). A great majority of these non-alcoholic fermentations are sourings. Lack of precise microbiological control under local conditions make it difficult to conduct pure alcoholic or non-alcoholic fermentation. Nevertheless, some degree of control is exercised in certain processing techniques, and many of the soured beverages produced have negligible or very low amounts of alcohol in them.

Snack foods:

There is a numerous number of snack foods, which can be derived from millet flour. These are found in plenty in such countries as India, Sudan, Nigeria and other countries (Vogela and Graham, 1979, quoted by Murty and Kumar, 1995). Different types of snack foods may be prepared by deep frying in the dough in fat. Thick porridges of fermented dough can be extruded or moulded and then deep-fried or sun-dried and then deep fried. Sugar, salt and other spices may be added to improve both the flavour and the nutritional status of the snack. However, these snack foods make up a small proportion of the total millet production.