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Inspection and Certification of Millet Seed Crop in India

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Introduction:

Certification of a seed crop such as millet seeks to maintain genetic purity and identity and make available to the public, through certification, high quality seeds and propagating materials of superior crop plants and varieties so grown and distributed as to ensure genetic identity and genetic purity. Seed certification is also designed to maintain reasonable standards of seed condition and quality prescribed for the crop. This can be obtained by (a) verification of seed sources, field inspection to verify conformity to prescribed standards andseed analysis to verify conformity to seed standard.

Pre-harvesting inspection:

This inspection should be made after the seed has matured and before harvesting of the milletis carried out. The purpose is to check that disease affected plants are removed, and off-type plants are other volunteers are rogued out. The inspection is carried out mainly to observe the prescribed standards for seed born diseases, which should be met as laid down. The inspectionconsiders the colour of grain, shape and size of earhead, compactness, etc (FAO, 1972).

Quality seed availability:

Many farmers keep their own millet seed which is invariably a mixture of local cultivars (Esele, 1989). They exercise care and select uniform ears and preserve them as seed for the next season. Farmers select the best heads in the field, cut them, dry and store them separatelyin long strawed bundles. This exercise helps farmers to carry forward varieties of millet that they feel to be superior and of higher quality.

Post-production Operations:

Pre-Harvest Operations:

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One of the major pre-harvest operations is the field inspection to ensure uniform ripening of the crop. If ripening is not uniform in the field, selective harvesting, may be done to pick the ripe heads that may start shattering, leaving the unripe heads for the next round of harvesting.Pre-harvest inspection (as mentioned in section 6) also ensures maintenance of quality of the crop.

Harvesting:

Harvesting of many varieties of millets is done by removing the individual heads with sicklesor small hand knives. This is sometimes preceded by breaking the stems (Aucland, 1921). Esele (1989) reported that, in Uganda, finger millet is harvested by a sharp hand or finger knife. The ears are cut with about 2 cm of stalk. The harvested ears are kept in a pile for a fewdays to ripen the grain further and to give the desirable taste. They are then sun-dried. Hulse *et al*., (1980) reported that harvesting of proso (common) millet is by pulling up the entire plant by the roots as soon as the grain is ripe in order to avoid excessive shattering, and is threshed immediately. Although the literature surveyed does not show any evidence of mechanized harvesting of millets, it is envisaged that combine-harvesting of millets is possible. It may be particularly sofor millet varieties which have uniform heights. However, the screen to retain good seed in the combine harvester would have to be very small, much smaller than that of maize and rice.

Transport:

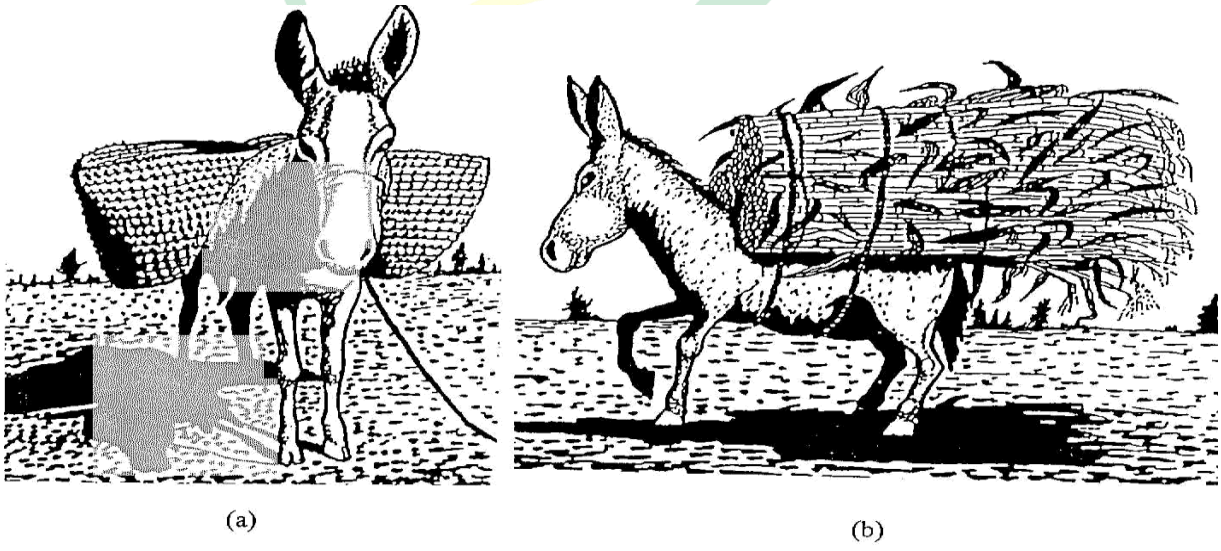

Figure 14: Transportation of millet (or other grains) using donkeys (a) bag or basket transportation (b) Transport of whole crop on the plant.

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Transportation of millet starts immediately after harvesting within the farm. For farmers who do not prefer drying their crop in the field, they transport the millet in bags to their homesteadwhere the heads are spread out on the sun to dry. Some farmers in central parts of Tanzania transport their millet by wrapping the crop in a piece of cloth which is loaded on to donkeys and transported to the homestead (Figure 14 a). Alternatively, whole crop may be tied up by rope and transported using donkeys (Figure 14 b).

Animal-drawn carts are also used for transportation of the crop from the field but these can only be afforded by medium scale farmers (personal experience) (Figure 15). If drying is donein the field, threshing must also be done in the field to avoid grain loss because the grains willfall off the heads very easily during transportation.

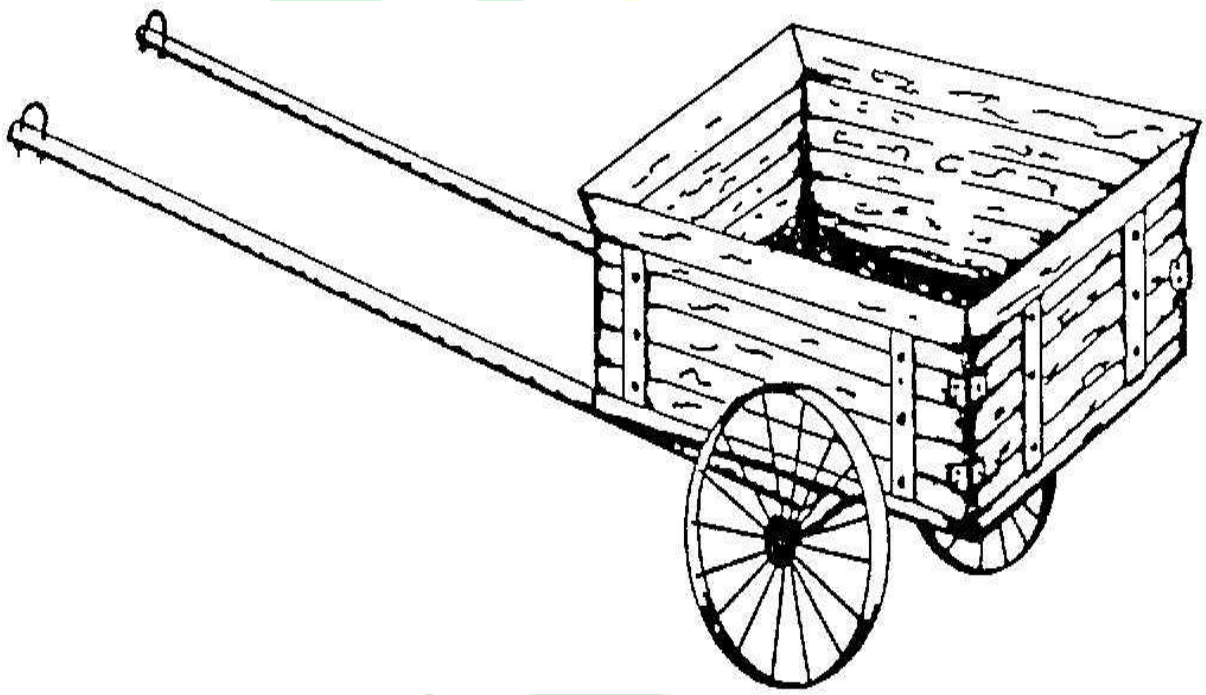

Figure 15: Pull carts for transportation of millet from farm using donkeys. (Source: Odogola and Henrikson, 1991).

The shelled millet is usually packed in sisal bags (or other types of bags) and transported tothe market. The bags may be stacked on sledges, which are pulled by animals (Figure 16). Individual farmers stack their bags along the road and await transportation. Trucks are the most common means of transporting millet from the rural areas to urban centres.

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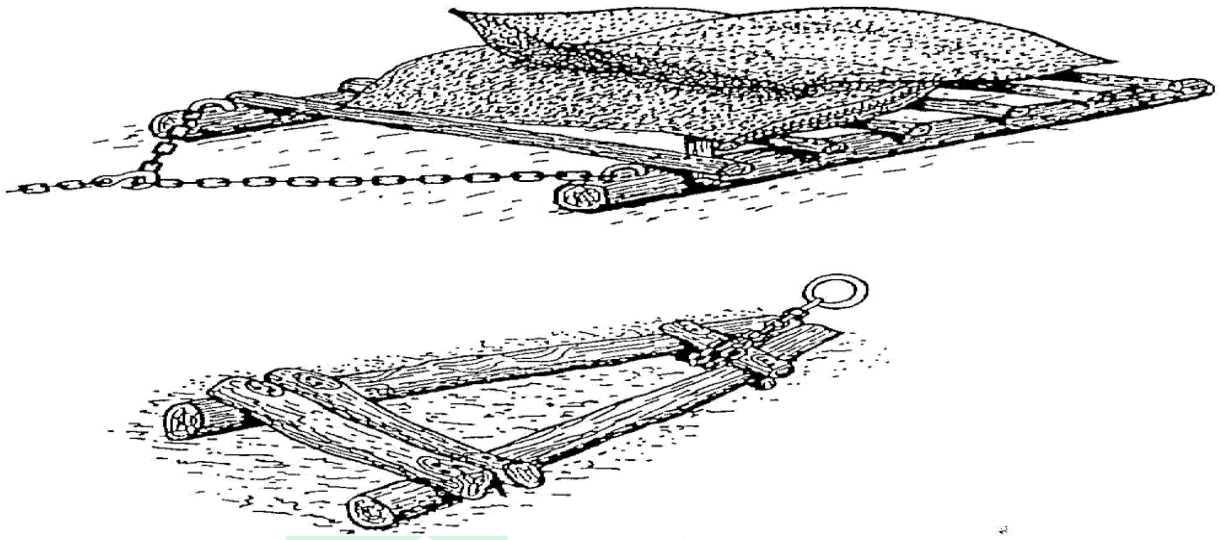

Figure-16: Traditional on farm transportation by using sledges.

Threshing:

Threshing is the removal of grain from harvested plant or plant part (Acland, 1921). Threshing of millet is done manually by women and men. It entails beating the millet heads with sticks or clubs repeatedly until almost all the grains are detached from the heads. Figure 17 (a) shows the process of threshing millet by beating. The beating action may be done either on a mat, canvas or bare ground. In order to ease grain collection after beating, sometimes the heads of millets may be stuffed in to bags, prior to beating. This practice is common in Tanzania, Kenya, Malawi, Mozambique, Zimbabwe, and Uganda.

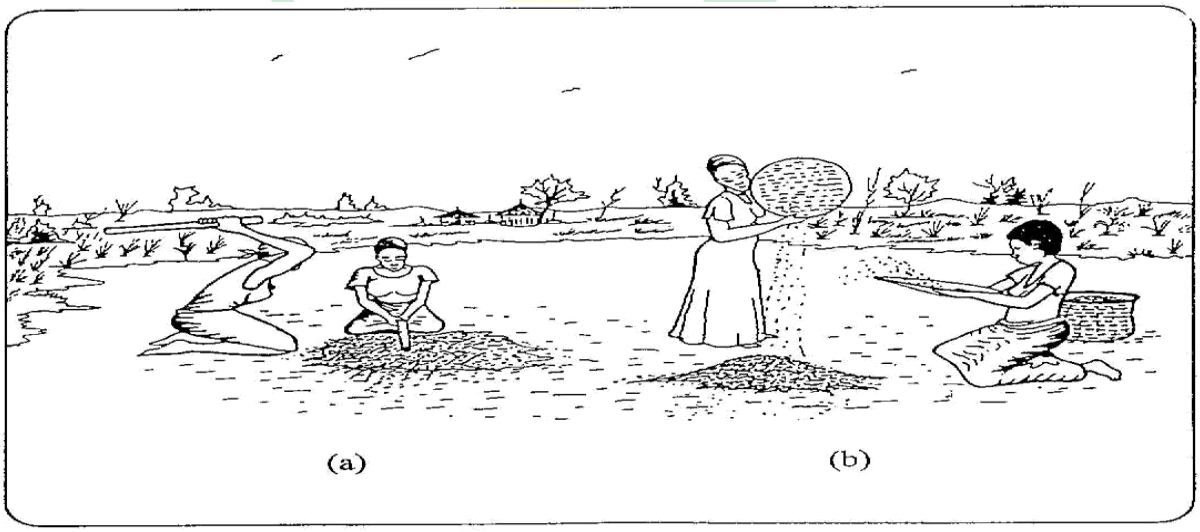

Figure 17: (a) Women threshing millet by beating with clubs on bare ground (b) Women cleaning millet by aspiration and winnowing (Source: Odogola and Henrikson, 1991).

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Drying: Information on the drying of millet is meagre (McFarlane *et al*., 1995). Millet grains harvested during rainy season may be left to dry in the field for up to two weeks. Further drying if required is completed after threshing on mats laid down on the sun, or plastic sheets (Figure 18a). Many Africans consider that foods prepared from rain-beaten grains have improved quality and palatability (Vogel and Graham, 1928; quoted by McFarlane *et al*., 1995). Mechanical drying may be employed to dry the millet grains, but this is expensive, and therefore, must only be recommended where returns are economical.

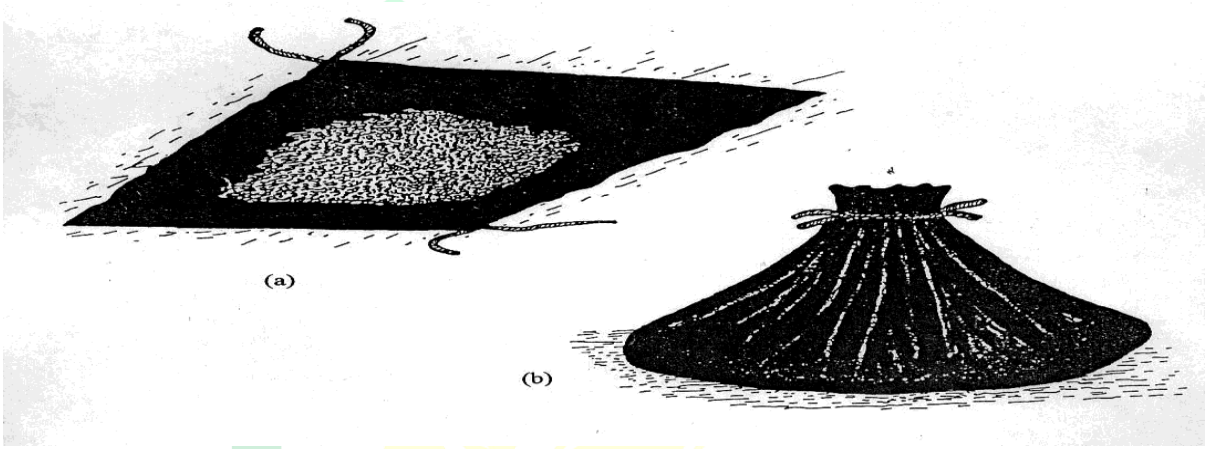

Figure 18: (a) Grains spread out to dry on a plastic sheet (b) grains wrapped up in a plastic sheet for rain protection. (Source: Odogola and Henrikson, 1991).

Cleaning:

Cleaning refers to separation of contaminants from produce, and complete removal of the contaminants so that the cleaned produce is free from re-contamination. The contaminants formillets may be sand (soil), small stones, leaves, shrivelled seeds, off-type seeds, broken seeds,glumes, sticks, chaff, parts of stems, insects, animal hair, animal excreta (e.g. rat and insect faeces) and more annoyingly, metal pieces. Metal pieces, if not removed, may damage the sieves of the milling machines if mechanized grinding is used. Sand and soil if not removed, will make the secondary products such as *ugali*, porridge and other products to taste gritty. Contamination by small stones, sand, off-type seeds, etc may arise from the drying ground, where the farmers in rural areas spread the millet heads on bare ground in the sun to dry. Sometimes, even the threshed grains are spread out on bare ground for drying.

Packaging:

After threshing, drying and cleaning, millets are usually bagged in to 100 kg hessian/sisal bags and sealed ready for transportation to distant markets (personal experience).

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Sometimesmillet grains may be packed in bags sewn from artificial polythene bags for either transportation or storage.

Storage:

Storage of crops is an essential component of the whole production system. It facilitates several farmer objectives, namely, availing food for the future and avoiding food shortage, providing seed during the next growing season, allows the farmer to sell at a time when the price is good.

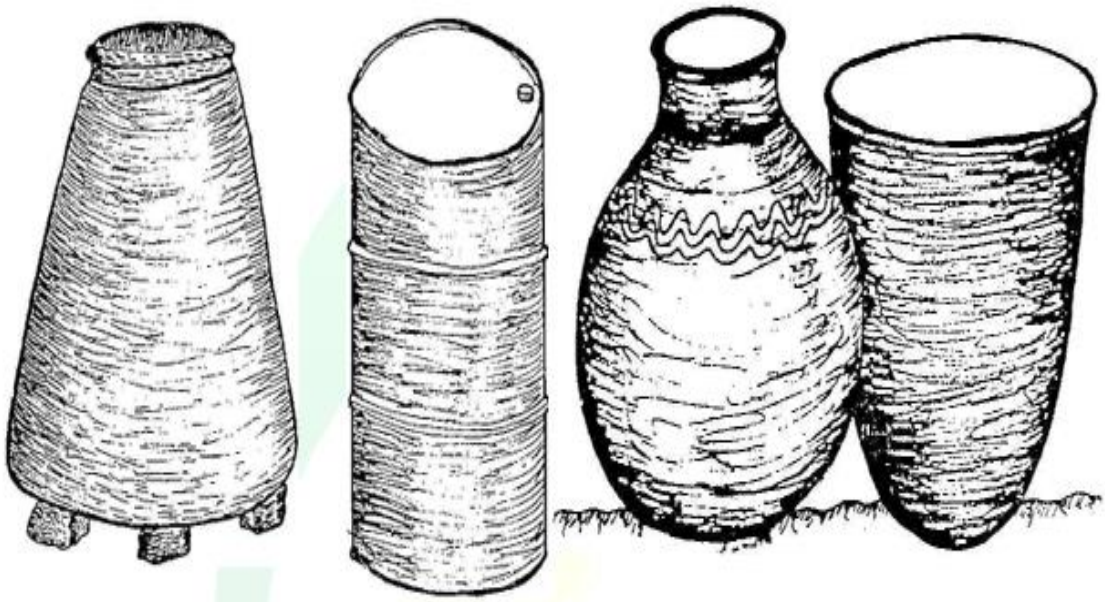

Figure-19, 20 & 21: Storage drum for air-tight storage of millet (Source: Odogola and Henrikson, 1991), Mud straw bins for storage of millet. (Source: Odogola and Henrikson, 1991) & Earthenware pot and jar for traditional storage of millet. (Source: Odogola and Henrikson, 1991).

Storage life in millets is inversely related to temperature and relative humidity in storage. Quality can be maintained by reducing storage temperature and humidity or moisture content (or all the three factors) (Mc Farlane, 1995). Mould growth and intrinsic deterioration of milletin storage are negligible when the grains are sufficiently dry. The relative humidity of 20 percent is marginally acceptable for storage, and 60-65 percent is preferable for storage. Less commonly, storage of millets may be by admixture with beans (e.g. in Botswana) which reduces the intergranular spaces between the beans, thereby impeding infestation of the beans by braccate beetles and optimizing the use of storage space (Mc Farlane, 1995).

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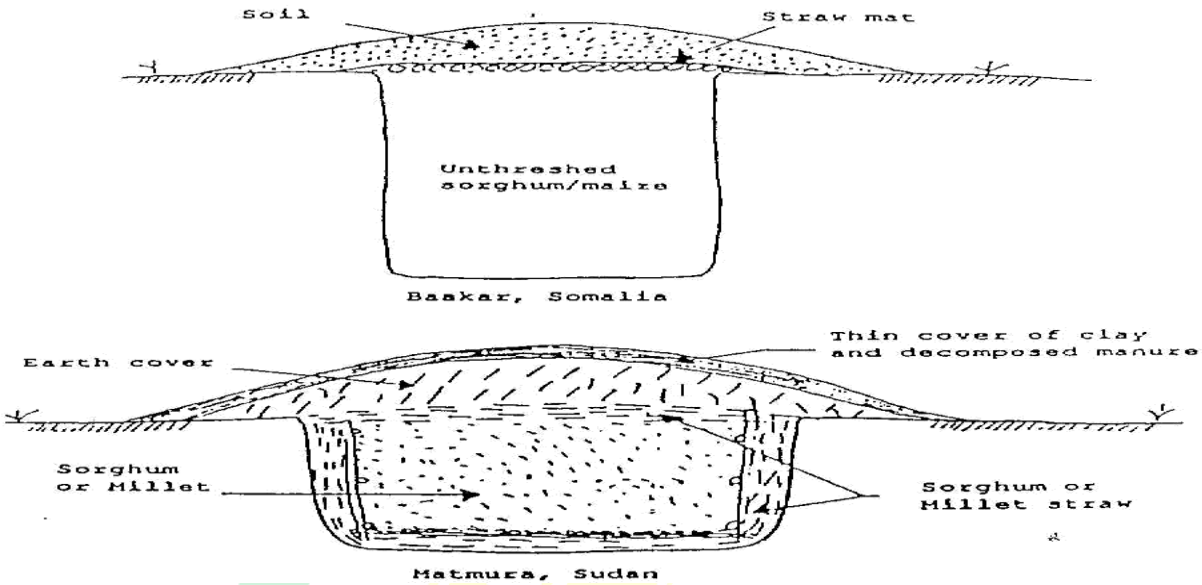

Figure-22: Traditional underground storage of millet and other grains. (Source: Odogola and Henrikson, 1991).

Overall losses:

Crop Loss Assessment Techniques: There are several approaches for estimating damage and yield losses in millets. One method,which has been successfully used in West Africa, involves the caging of individual panicles or whole plant stands into which a known number of insects are introduced (Krall *et al*., 1995). Apart from providing direct quantitative information on pest damage, this method canalso be used to study pest activity. However, field trials and extensive surveys are necessary to obtain data on the extent of crop damage and yield losses. The crop loss assessment techniques can be classified as follows (Nwanze, 1988, quoted by Krall *et al*., 1995):

(a) Incidence ratio,

(b) Visual score paired analysis,

(c) Damage density loss ratio &

(d) Quantitative assessment (insecticide trials).

Conclusion:

Grain size for many millets is relatively very small compared to other grains, and this tends to reduce susceptibility to infestation by storage insects, but to increase the likelihood of loss by spillage and seepage from sacks, and also by contamination by sand or other foreign matter.

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Therefore, there are possibilities of difficulties of assessing percentage grain damage and consequent weight loss (McFarlane, 1995). Grain cleaning by sieving and winnowing may also be less efficient and more wasteful.