

DRAFT TANZANIA STANDARD

Harvest and post-harvest handling (PHHS) of dry beans — Code of Practice

TANZANIA BUREAU OF STANDARDS

0. Foreword

Pulses have great potential as an exceptionally nutritive and very rich protein food. It can supply the much needed protein to human diets, because it contains about 40 % protein of superior quality, minerals, crude fibre, vitamins and the essential amino acids.

In addition to being an important source of human food and animal feed, pulses also play an important role in sustaining soil fertility by improving physical properties of soil and fixing atmospheric nitrogen. Being a drought resistant crop, it is suitable for rain fed farming and predominantly used as an intercrop with other crops.

It was found that there is reduction in weight of ready to consume pulses during harvesting operations, farm storage, transport and market storage. Post-harvest losses of pulses are estimated to be upto 20%. All these reasons led to the development of this standard which provides guidelines on post-harvest handling and storage of dry beans.

This standard has been developed to take into account:

- a) the needs of the market for the quality beans;
- b) the need to facilitate fair domestic, regional and international trade and prevent technical barriers to trade by establishing a common trading language for crop producers, buyers and sellers;
- c) the needs of the producers in gaining knowledge of market standards, conformity assessment and post harvest handling;
- d) the need to transport the product in a manner that ensures keeping of quality until it reaches the consumer;
- e) the quality and safety parameters that products should meet before they are put on the market; and
- f) the need to promote good agricultural practices that will enhance wider market access, involvement of small-scale traders and hence making farming a viable means of generating income

Post-Harvest Handling and Storage (PHHS) of dry beans - Guidelines

1. Scope

This Tanzania Standard provides the code of practice for harvest and post-Harvest andling for dry beans (*Phaseolus spp*).

2. 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.

TZS 875, Dry beans - Specification

TZS 109, Food Processing unit – Code of Hygiene

3. Terms and definitions

For the purposes of this standard, the following terms and definitions should apply.

3.1

bean

dry threshed pulse of the species *Phaseolus spp* commonly used for human consumption.

3.2

harvesting

operation of gathering the matured pods of beans with or without plant

3.3

drying of pods

operation during which pods are dried to facilitate threshing

3.4

threshing

operation of separating the dried pod from the plant

3.5

shelling

operation of separating the beans from the dried pod

3.5

winnowing

operation of blowing air through beans in order to remove the chaff

3.6

drying of beans

operation during which beans are dried to the safe storage moisture content

3.7

moisture content

amount of water in the bean expressed as percentage of the total weight of the sample

3.8

transportation

1

process of moving beans from one location to another during different unit operations of post-harvest handling

3.9

post-harvest losses

measurable quantitative and qualitative loss of beans occurred during the various post-harvest operations likeharvesting, threshing, drying, cleaning, transporting and storage

3.9.1

quantitative loss

reduction in weight and volume

3.9.2

qualitative loss

loss which occurs as a result of degradation of physical, chemical and biological properties, under the effect of environmental conditions

4. General guidelines

Throughout the whole process of PHHS the following should be considered:

- a) the products being handled should comply with TZS 875;
- b) hygiene conditions should be maintained throughout the whole process of PHHS as per TZS 109;
- c) facilities, materials and equipment used should comply with the requirements of relevant standards;
- d) chemicals and their use should comply with relevant standards and regulations; and
- e) measures should be taken to prevent attacks by pests, moulds and rodents throughout the PHHS process(for the control of pest refer to Annex A).

5. Specific guidelines

5.1 Pre-harvesting

Pre-harvesting should consider the following:

- a) prior to the harvest, it is important that farmers are already prepared for their postharvest activities and they should ensure that:
 - i. the equipment needed for their harvest and postharvest activities is available and in good working condition;
 - ii. the place of important activities like drying and threshing has been identified;
 - iii. there should be sufficient storage space for the crop;
 - iv. the grain stores and food grade packaging materials have been thoroughly cleaned; and
 - v. the residues of the old harvest (last season's crop) have been removed from all cracks and crevices and disposed in a hygienic manner.
- b) farmers should consider the following;
 - i. harvesting should be done timely. Timely harvesting minimizes post harvest losses;
 - ii. beans should be harvested, when leaves start falling and pods look dry, but before getting driedcompletely;
 - iii. the time of harvesting should be identified by the change of colour of the plant from green to yellow showing the maturity of beans;
 - iv. not to wait for stalks and leaves to completely dry because the dried beans may shatter in the field itself;

beans cultivated should be harvested when the beans are physiologically matured with 14 % - 16% moisture;

- v. pulling of beans should start late evening or early in the morning or in dump conditions before the dew has evaporated;
- vi. avoid pest infestation prior to harvesting.

5.2 Harvesting

Harvesting activity should be done as follows:

- (i) Farmer should adopt selective harvesting of matured pods leaving the immature pods in the plant itself for few days to get complete maturity.
- (ii) If there are large scale farms to be harvested, the whole plant with 80 % maturity of pods should be harvested and transported to drying yard;
- (iii) harvesting before the crops mature, usually result lower yields, higher proportion of immature seeds, poor beans quality and more chances of disease attack during storage and should be avoided; the moisture in the beans at the time of harvesting should be between 16 %- 20%;
 - a) the harvest of the matured pods of beans should be done without splitting of pods;
 - b) appropriate harvesting equipment should be used;
 - c) delay in harvesting results in shattering and cracking of beans in the pods and exposure to insects, rodents, and pests attack;
 - d) the exposure of the pods to the rain or excessive dew should be avoided
 - e) harvested beans should be kept separately for each variety;
 - f) pods of the beans that have grown in direct contact with soil should be discarded, as these are frequently damaged;
 - g) harvested pods of the beans should be transported immediately to the drying yard; and
 - h) avoid leaving the pods of the beans in the plant itself and falling of the pods on the ground.

5.3 Drying of pods

Drying of pods should be done as follows:

- a) drying of the pods of the bean should be done immediately after harvesting;
- b) if there is a delay in drying, harvested pods should be kept under appropriate shade with plenty of aeration to avoid heating of the pods;
- c) for rapid drying the following should be considered:
 - i. a single layer of thin bed drying of pods should be used; and
 - ii. the pods should be regularly turned for uniformity of drying.
- d) for better sanitation, clean concrete floor or tarpaulin should be used to dry the pods;
- e) care should be taken to protect the pods from soil contamination, cyclonic wind and rain or dew;

f) where heated air is used to dry the pods, temperature and drying time should be synchronized so that they do not result in adverse effect on the nutritional composition and quality of the beans in its intended use;

- g) the air heated drying machine should comply with the relevant standard;
- h) any source of contamination and pest infestation should be avoided during drying; and

i) hygienic practices should be followed during drying.

5.4 Shelling

Shelling should be done as follows:

- a) The machine used for shelling of pods should comply with relevant standards;
- b) Shelling may be done by manual methods or by power operated sheller for large quantities;
- c) When shelling is done by manual methods avoid using heavy tools which may impart damage to the beans
- d) When power operated sheller are used, the clearance between the concave and cylinder should beadjusted so that the percentage of broken beans should be minimized;
- e) Power operated Sheller should have operator safety arrangements like the belt and pulley guard as per the relevant standard; and
- f) Shelling machine should not be a source of contamination such as rust, paint, grease.

5.5 Drying of beans

The following should be considered in drying of beans:

- a) the drying of the beans should be done immediately after shelling;
- b) shelled beans should be dried to 13.5 % moisture content prior to packaging and storing;
- c) the drying area (concrete floor, tarpaulin) should be clean and not be a source of contamination to thebeans; and
- d) where heated air is used to dry the beans, temperature and drying time should be synchronized so that theydo not result in adverse effect on the nutritional composition and quality of the beans in its intended use.
- e) a single layer of thin bed drying of beans should be used; and
- f) the beans should be regularly turned for uniformity of drying.

5.6 Sorting and Cleaning

5.6.1 Cleaning may be done manually or by using machine in order for the grains to comply with the requirements specified in TZS 875/EAS 46.

5.6.2 When power operated cleaning machine is used, care should be taken by adjusting the fan speed to reduce the loss of beans in the chaffy outlet.

5.6.3 The beans should be aspirated to remove all the straws, chaff and leafy vegetative matter.

5.6.4 Defective (pest damaged, discoloured, stained, rotten, diseased, immature, and shrivelled, and broken) grains should be removed.

5.7 Packaging

Dry beans should be packed in containers made of food grade packaging material which will safeguard the hygienic, nutritional and organoleptic qualities of the product.

5.8 Transportation

Transportation of dry beans should consider the following:

- a) beans should be handled and transported in such a way so that they remain well protected from sun, rain or other sources of excessive heat, objectionable odour and from any type of cross infestation beans may be transported in vehicle itself (bulk) or in transportable container then the vehicle and container should be clean, dry and free from undesirable odours and infestation;
- b) if the vehicle is not fully enclosed, it should have a covering such as tarpaulin to keep out of the rain or

any form of water, sun or dust;

- c) transported beans should be well ventilated with dry air to remove moisture resulting from respiration of the beans and to prevent moisture condensation; and
- d) transportation of beans with chemicals, products in liquid form or any other substances which may contaminate the beans should be avoided.

6. Major storage pests and their control measures

Measures should be taken to control insect infestation using either physical, chemical, mechanical or biological means or combinations of these methods. Assistance may be obtained from extension officers/agricultural officers and other authorized pest control experts on the respective areas in identification and control of storage pest. The prevalent list of storage pest are given in Annex A.

Annex A (informative)

Major dry beans storage pests

| Pest | Damage | | |
|--|--|--|--|
| 1. Pulse beetle Callosobruchus sps. | i. The larvae bore into beans and feed the entire content of the beans leaving only the shell (seed coat) behind. | | |
| | ii. Adults cut out circular holes in the beans | | |
| | iii. Sometimes these insects begin their infestation, when the pods are in the ripening stage in the field, and a carried with the beans into the store after harvesting | | |
| | iv. These pests do not attack split pulses | | |
| 2.Khapra beetle <i>Trogoderma granarium</i> (Everts) | i. Larvae are one of the most serious stored grain pests but the beetle itself does not damage. ii. The larvae starts feeding from embryopoint and later consume the entire kernel, which makes the grain hollow and only the husk remains. iii. Infested beans are full with frass, cast skins of larvae and excreta, which results in deterioration of quality of beans iv. The larvae are often found on edges of jute stacks and make the infested store unhygienic | | |
| 3. Dried bean weevil | i. Infestation is induced in the field on ripening of crop whenpods are split. | | |
| 6.1 Acanthoscelide ^s obtectus (Say) | | | |
| | ii. Larvae feed on theseed by boring | | |

| 4. Rice moth <i>Corcyra cephalonica</i> (Stainton) | i. Larvae contaminate the beans with dense webbing, excreta and hairs. ii. Whole beans arebound into lumps. |
|--|---|
| 5.Confused flour beetle Tribolium confusum J.du V. | i. Beetle and larvae both feed on broken and damaged beans produced by milling and handling or attacked damaged beans of other insects. |
| 6.Rodents | i. Rodents eat whole beans, broken beans, flour etc. They spill more beans than they eat. Rodents also contaminate beans with hair, urine and feces, which cause diseases like cholera, food poisoning, ringworm, rabies etc. They also damage the storage structures and other accessories of store like wire and cable etc. |
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