

Total post-harvest cereal system

1. General information

Each type of cereal requires a specific post-harvest treatment, however, there are certain general principles that apply to most of them.

Cereals undergo a number of processing stages between harvest and consumption. This chain of processes is often referred to as the total post-harvest system. The post-harvest system can be split into three distinct areas.

The first is the preparation of harvested grain for storage. The second, which is referred to as primary processing, involves further treatment of the grain to clean it, remove the husk or reduce the size. The products from primary processing are still not consumable.

The third stage (secondary processing) transforms the grains into edible products.

Primary processing involves several different processes, designed to clean, sort and remove the inedible fractions from the grains.

Primary processing of cereals includes cleaning, grading, hulling, milling, pounding, grinding, tempering, parboiling, soaking, drying, sieving.

Secondary processing of cereals (or 'adding value' to cereals) is the utilization of the primary products (whole grains, flakes or flour) to make more interesting products and add variety to the diet. Secondary processing of cereals includes the following processes: fermentation, baking, puffing, flaking, frying and extrusion.

Fermentation. Doughs made from cereal flour can be fermented to make a range of products.

Baking. Doughs and batters made from cereal flours are baked to produce a range of foods.

Puffing. Puffed grains are often used as breakfast cereals or as snack food. During puffing, grains are exposed to a very high steam pressure which causes the grain to burst open. The puffed grains can be further processed by toasting, coating or mixing with other ingredients.

Flaking. Flaked cereals are partially cooked and can be used as quick-cooking or ready to eat foods. The grains are softened by partially cooking in steam. They are then pressed or

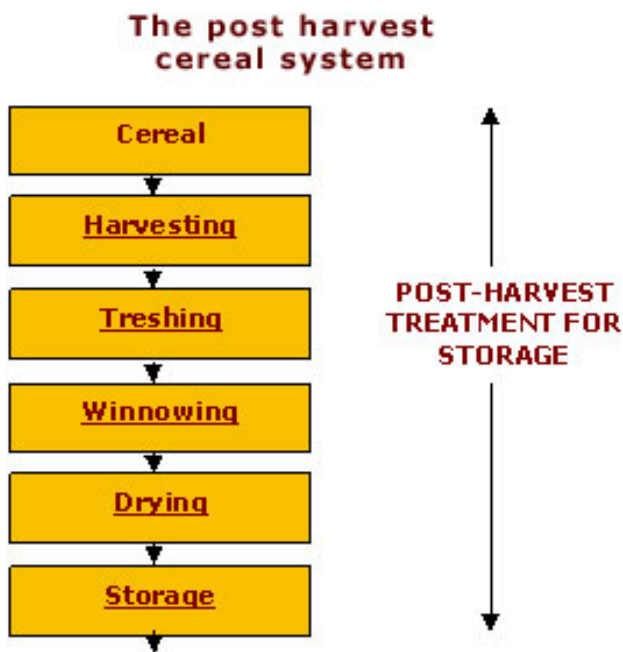
rolled into flakes which are dried. The flakes are eaten crisp and should have a moisture content of below 7%.

Extrusion. Extrusion involves heating and forcing food (usually a dough) through a small hole to make strands or other shapes. The extruded shapes then undergo further processing such as frying, boiling or drying. Extruded products include pastas, noodles, snack foods and breakfast cereals.

Projects and small businesses may involve only one or several of the activities in the total chain, from the growing of crops through to the production of edible products. Some small businesses are set up to clean and package wholegrains. These businesses can be successful as there is very little need for equipment. However, as with all businesses, there must be a clear demand for the product.

2. The post-harvest cereal system

2.1. Post-harvest treatment for storage



A.1-Harvesting

There is an optimum time for harvesting cereals, depending on the maturity of the crop and the climatic conditions. This has a significant effect on the quality of the grain during storage. Harvesting often begins before the grain is ripe and continues until mold and insect damage are prevalent. Grain not fully ripened contains a higher proportion of moisture and

will deteriorate more quickly than mature grains because the enzyme systems are still active. If the grain remains in the field after maturing, it may spoil through wetting caused by morning droplets and rain showers. There is also an increased risk of insect damage.

Cereals are traditionally harvested manually. There are three main types of harvesting equipment for the small scale producer: manual, animal powered and engine powered. A range of mechanized harvesting equipment suitable for the small-scale farmer has been developed. Some of it is more efficient and cost effective than others. Harvested crops are left in the field for a few days to dry before further processing.

A.2.-Threshing

Threshing is the removal of grains from the rest of the plant. It involves three different operations: Separating the grain from the panicle; sorting the grain from the straw; winnowing the chaff from the grain. Separation of the grain from the panicle is the most energy-demanding of the three processes. It is the first process to have been mechanized. Sorting the grain from the straw is relatively easy, but is difficult to mechanize. Winnowing is relatively easy, both by hand and by machine.

Most manual threshing methods use an implement to separate the grain from the ears and straw. The simplest method is a stick or hinged flail that is used to beat the crop while it is spread on the floor. A range of engine powered threshers are available.

A.3.-Winnowing

Winnowing is the separation of the grains from the chaff or straw. It is traditionally carried out by lifting and tossing the threshed material so that the lighter chaff and straw get blown to one side while the heavier seeds fall down vertically. Hand-held winnowing baskets are used to shake the seeds to separate out the dirt and chaff. They are very effective, but slow. There is a range of winnowing machines that use a fan to create artificial wind. This speeds up the winnowing process. Some of these contains sieves and screens that grade the grains as well.

A.4.-Drying

Prior to storage or further processing, cereal grains need to be dried. The most cost-effective method is to spread out in the sun to dry. In humid climates it may be necessary to use an artificial dryer. Simple grain dryers can be made from a large rectangular box or tray with a perforated base. The grain is spread over the base of the box and hot air is blown up through a lower chamber by a fan.

The fan can be powered by diesel or electricity and the heat supplied by kerosene, electricity, gas or burning biomass. Cereal grains should be dried to 10-15% moisture before storage.

A.5.-Storage

Dried grains are stored in bulk until required for processing. The grains should be inspected regularly for signs of spoilage and the moisture content tested. If the grain has picked up moisture it should be re-dried. Grains are often protected with insecticides and must be stored in rodent-proof containers.