



**FEDERAL UNIVERSITY OF TECHNOLOGY
MINNA**

**THE END OF CROP STORAGE
IS THE BEGINNING OF
NEW PRODUCTS**

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Sch. of Sol. & Tech. Education
Federal University of Technology
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B. Sc., M. Sc. (Alabama, USA), PhD (Bedford, UK)

Professor of Crop Production

INAUGURAL LECTURE SERIES 70

14TH MARCH, 2019



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This 70th Inaugural Lecture was delivered under
the Distinguished Chairmanship of:

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Vice-Chancellor
Federal University of Technology, Minna

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ISSN 2550 - 7087

Published by:

University Seminar and Colloquium Committee
Federal University of Technology, Minna.

14th March, 2019

Design + Print:

Global Links Communications, Nigeria

©: 0805 607 4844, 0703 644 6818



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THE END OF CROP STORAGE IS THE BEGINNING OF NEW PRODUCTS

1.0 Introduction

Storage of agricultural produce after harvest is as old as agriculture itself. Crops are usually gathered and kept for future use. The process may be diverse and the length of time may be long or short. Normally, harvested crops cannot be consumed all at the same time and seeds need to be preserved for the next planting season. There is, therefore, the need to store produce in such a way that its quality does not deteriorate.

In ancient history, harvested crops were preserved as an insurance against famine. The celebrated case in the Bible was when Joseph was asked to buy grains for seven years (Gen 41) against seven years of famine that was coming. Overtime, farmers have learnt different techniques for storing their crops. In the past, storage techniques were devoid of chemical additives unlike now.

It is essential that crops to be stored for future use either for consumption or planting must be cared for right from the farm. Several pest and disease organisms cross over from pre-harvest to post-harvest stage. A well-known example is the infestation of cowpea the presence of *Callosobruchus maculatus* (the common bean weevils), beginning from the farm into the storage room. Critical also is the damage incurred by crops during harvest especially fruits, tubers and vegetables. Bruises or defects during harvest could enlarge during storage.

The topic of this Inaugural lecture was chosen because many people have thought that where crop storage ends is the end of that year but my perspective is to see crop storage as **“The end of crop storage is the beginning of new products.”** The Inaugural lecture is to look at crop storage as the coming out with new things/products that can help people to stay alive.

If crop produce is to be stored, it is important to begin with a high quality product. Each lot of produce must not contain damaged or diseased units, and containers must be well ventilated and strong enough to withstand stacking. In general, proper storage practices include temperature control, relative humidity control, air circulation and maintenance of space between containers for adequate ventilation, and avoiding incompatible product mixes.

1.1 Reasons why farmers store agricultural products

Mr. Chairman Sir and distinguished audience this Inaugural lecture will discuss how agricultural products are harvested and stored by farmers. In most cases, the products are stored without further handling for shorter or longer periods. Unfortunately, losses of 25 percent for stored grain crops and 40-50 percent for vegetables are not unusual in the tropics. For the farmers, stored products fulfil various needs:

Food for the family

It is important to have enough food; but to stay healthy, it is also important to have food that is of good quality. Farmers and their families can clearly see whether they will run out of grain to eat before the next harvest, but loss of food quality is more difficult to measure. Some insects eat the best parts of the grain, which contain the vitamins and minerals that make the food nutritious. Farmers may not see this loss and therefore need to know how to prevent it.

Income

Farmers have to buy or barter for things they need but do not produce themselves. Most farmers sell the products they do not use for food or planting material to earn money, or they trade their own products for the things they need. If farmers have only drying and storage facilities, they cannot keep their products safely for long and are forced to sell the products soon after harvest. The prices are low at this time because no one needs grain. Everyone is harvesting and there is plenty of grain available. If the farmers can dry and store the products safely, they may be encouraged to grow more than they need for their families. Good grain storage can thus lead to more food, more money, better planting material, and a better standard of living for farmers and their families.

Seeds for next planting season

Part of the harvest is used as propagation material for the next cropping season. If seeds or tubers are not stored well, some will not germinate (grow) when planted, which means the farmer will have to plant many more to get enough plants. The seedlings may also not grow at the same speed which will cause problems for the farmers during weeding and harvesting.

With this, I wish to encourage small-scale farmers to improve their storage methods for grains, roots and tubers, fruits and vegetables.

2.0 How to retain the quality of stored agricultural products

2.1 The product to be stored determines its shelf life

Agricultural products cannot be stored indefinitely. The maximum storage duration (the shelf life) of agricultural products varies and can be only a few days for some fruits and vegetables, a

couple of months for most tubers and bulbs, and over a year for dried food grains or other seeds (Figure 1).

The shelf life of some fresh agricultural products can be extended by cooling, but this is expensive (Raghavan *et al.*, 2005; Vigneault, 2005). For all crops, the most important thing is that they remain edible during storage. Most food grains, fruits and vegetables should also keep their attractive appearance. A wrong colour, wrinkles, etc., make them less attractive to consumers.

For each product, numerous factors pose a threat to their shelf life. These threats are present not only during storage, but during the whole pipeline of food production to consumption or marketing (see Figure 2). Each step can have an impact on the quality and quantity of the products.

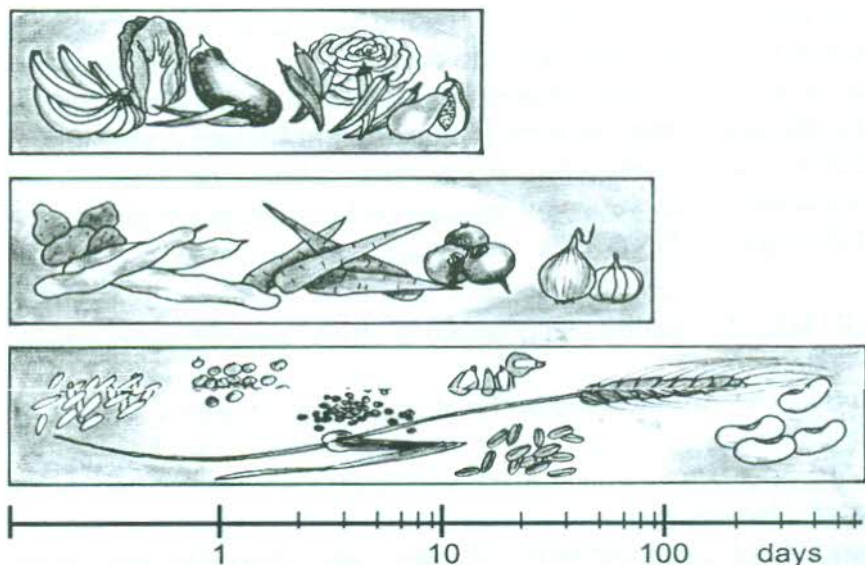


Figure 1: The shelf life of agricultural products depends, on the product itself

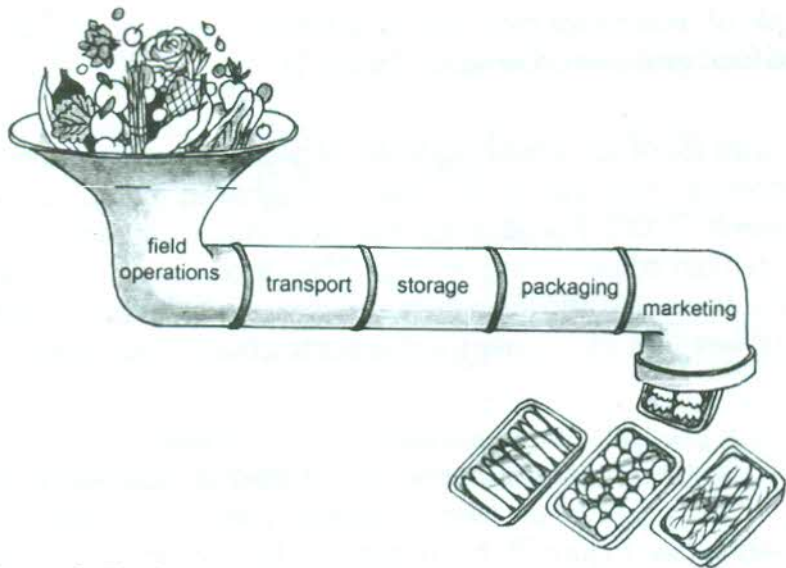


Figure 2: Food pipeline from harvest to consumption

If proper storage is not possible and a product is likely to spoil before it can be consumed, the best solution is often to preserve it. Preservation means modifying a product so that its properties change and it can be kept longer. Examples are drying fruits, making flour from yam or cassava tubers, or mash from tomatoes. In this way, new products with different properties are made that are still edible.

2.2 Why the quality and quantity of stored agricultural products deteriorate

Two factors are involved in the storage of food grains, fruits and vegetables:

Internal factors

Agricultural products are still alive and their life processes continue after the harvest. All products respire (breathe). They use oxygen from the air to burn their reserves. The products thus

become thinner, and they produce carbon dioxide and heat. Another continuing process is ripening. Fruits often change colour as they ripen, and their tissue gradually becomes softer (Adeniyi and Ayandiji, 2014). Eventually, the fruit becomes overripe and is then unsuitable for consumption. Fruits and vegetables, and to a slightly lesser degree tubers, tend to lose water as they get older in storage.

The product becomes wrinkled and is less attractive to consumers. Respiration, ripening and water loss are internal factors that determine the quality of stored products (Tsado. 2015; Tsado *et. al.*, 2018)

External factors

External factors, which also play an important role in the loss of product quality and quantity, include:

Mechanical Injury

Seeds, roots and tubers are easily injured during harvest. Fresh fruits and vegetables are particularly susceptible to cuts and bruises owing to their tender texture and high moisture content. Poor handling, unsuitable packaging and improper packing during transportation are the causes of bruising (LeBlanc and Hui, 2005; Leblanc and Vigneault, 2006), cutting, breaking, impact wounding, and other forms of injury in fresh fruits and vegetables.

Microbial Load: Fungi and Bacteria

After harvesting, the natural defence mechanisms of agricultural products rapidly decline. Bacteria and fungi then easily infect roots, tubers, fruits and vegetables. Most fungi have threadlike structures. These are also called moulds. Bacteria and fungi cause rotting of the products, if the products are wet enough to support

