What is postharvest handling?

In agriculture, postharvest handling is the stage of crop production immediately following harvest:

- Field handling
- Transporting to packing house
- Operations at the packing house
  - cleaning
  - Sorting/grading
- packaging
- storage (temporary and long term)
- Transportation

- The instant a crop is removed from the ground, or separated from its parent plant, it begins to deteriorate.
- Postharvest treatment determines final quality, whether a crop is sold for fresh consumption.
Purpose of postharvest management

- The activities in the post harvest system ensures that quality produce reaches the marketplace.
- The food safety and hygiene issues and controls that are taken there of.

There are two aims of postharvest practices:
- Maintain quality of harvested produce (appearance, texture, flavour, nutritive value and safety).
- Reduce loss (quantitative & qualitative) between harvest and consumption.

Important Quality of any produce cannot be IMPROVED during the PH chain but only MAINTAINED. Hence, Importance of the production of Good Quality produce
What is postharvest handling?

There are typical two types of crop postharvest systems:

- **(1) Durables and (2) perishables**
  - **For durables**, largely depended on storage facilities for months or even years.
    - Examples of durables are cereals/grains (maize, wheat, sorghum etc) and legumes (beans, nuts, peas etc)
  - **Perishables**, which are generally not stored for long but depend on an effective cold chain.
    - Examples of perishables are tubers, fruit and vegetables
    - Some perishables can be dried and packaged and then stored for longer periods.
Why postharvest handling

- The instant a crop is removed from the ground, or separated from its parent plant, it begins to deteriorate.
- Postharvest treatment determines final quality, whether a crop is sold for fresh consumption or spoilt.

Goals of post-harvest handling:
- Keeping the product cool/fresh
- To avoid moisture loss
- Slow down undesirable chemical changes
- Avoiding physical damage such as bruising
- To delay spoilage
Climate change is expected to result in:

- A rise in global temperatures, Southern Africa by 1°C by 2030 and another 1°C - 2°C by 2050
- Some areas will receive more rainfall associated with increased evaporation e.g. East Africa
- Other areas will receive less rainfall, Southern African 10% less
- More extreme weather;
  - periods of heavy rainfall (within a year or flash floods)
  - frequent droughts
  - and hot weather are likely to be longer.
- More variable and therefore less predictable weather
Impact of climate change

- Most food is grown by small scale farmers under rain-fed annual cropping systems in Southern Africa.
- **Climate change is likely to reduce the length of the growing season.**
- This might force large regions of marginal agriculture out of production.
- Different places affected differently but overall a deficit.
- Efforts have to be made that whatever is harvested is preserved and reaches the consumer.
- Need to focus on preserving the limited produce: reduce postharvest losses to cover deficit.
- Therefore losses should be minimised through control or elimination of factors that cause postharvest losses.
Factors affecting postharvest systems

• Environmental factors:
  – Temperature;
  – Relative humidity
  – Gas composition

• Technical factors:
  – lack of skilled manpower
  – and long storage time.

• Biological and Chemical factors

• Mechanical factors:
  – Poor harvesting practices
  – Careless handling: dropping, throwing, stamping
  – Inappropriate packaging or containers with splintered wood, sharp edges.
  – Over/under packaging of containers
Temperature and relative humidity

- Climate change will affect all the factors earlier on:
- Environmental factors will be influenced more
- From the environmental factors temperature will be influenced more (it will rise)

**Changed levels of environmental factors:**
- seed viability.
- storage insect pest survival and reproduction
- storage protectant performance.
- Shelf-life of different food products
- Energy requirements for drying and cooling
Effect of increased temperature

• High temperatures lead to:
  – PHL are accelerated at higher temperatures and with longer storage durations.
  – increased rate of microbial changes, activating enzymatic reactions in produce.
  – Respiration rate, metabolic processes and ethylene biosynthesis of some fruit increase with air/room temperature.
  – rot organisms spread most rapidly at warm harvest temperatures
  – Respiration rates can double, triple or even quadruple with every increase in temperature at certain levels....

Precooling of fresh produce will be required
Pre-cooling of fresh produce

– rapid removal of field heat,

Result?

• Reduces heat produced by respiration
• Reduces production of moisture and accumulation on vegetables,
• Slows ethylene production
• Reduces water loss
• Limits growth of decay organisms
• Decreases rate of deterioration

Pre-cooling methods are energy intensive and since the temperatures will rise as a result of global warming the cooling load will be high. How is energy produced?
Energy requirements of pre-cooling

- Mechanical refrigeration
- Vacuum cooling
- Hydro-cooling
- Forced air cooling
- Including evaporation cooling

- High ambient temperatures meaning high energy requirements to cool fresh produce to storage temperatures.
- This is an opportunity for use of solar energy!
Impact of an increase in temperature on postharvest activities

**Harvesting and drying**
- Increased rate of crop drying, in the field and homestead
- Increased fire risk of mature crop or stored crop

**Primary processing**
- Heat stress during laborious manual activities (shelling / threshing; dehulling)

**Pest & disease management**
- Faster reproduction of insect pests and diseases (shorter lifecycles due to higher temperatures) in field leading to more rapid build-up of insects and fungi in stored produce
- Increased risk of fungal rot and mycotoxin contamination of stored products.
- Efficacy of some grain protectant active ingredients decrease and others increase
Increased temperature

**Storing**

- Higher pest incidence and carry-over during ‘cold season’
- Increase in the need for thorough storage structure hygiene and management of residual infestation prior to storing new crop
- Increased pest reproduction and mobility leading to need to re-winnow, sort and re-treat grain mid-way through storage period (*storage costs will increase*)
- Increased moisture migration and condensation resulting in rotting zones in grain bulks with excess free moisture
- Increase risk of seed viability/damage especially for some legumes e.g. ground nuts
Effect of Increased Temperature

Secondary processing
- Increased bio-deterioration leading to shorter shelf life of products
- Overheating of machinery reduces profits resulting in longer down time.

Transportation
- Heat stress (of humans, livestock, & vehicles) while transporting crops
Overall Impact of Climate Change

• Africa’s population will be 2 billion by 2050
• Food production has to increase in line
• 65% of food insecurity resultant from climate change by 2050 will be in Africa.
• Africa will largely be depended on food imports.
• To meet deficit postharvest losses have to be reduced.
• This means that postharvest management is one of the critical issues that as a region we need to focus on!!!
Thank you