LEARNER GUIDE

Crop Production: Harvesting

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Learning Unit 1

Unit Standard	
116373	**Manage the harvesting process of agricultural crops**

Specific Outcomes

SO1: Investigate new tools / equipment and methods of harvesting to compliment existing plan and procedures and to fit in with GAP.

SO2: Manage the maturity-indexing (MI) process and decide on procedures.

SO3: Manage the harvesting of crops according to specified market needs and logistics.

SO4: Manage the health, hygiene and safety plan according to GAP.

SO5: Manage the disposal of waste according to specified procedures in accordance with good agricultural practices (GAP).

SO6: Manage the care and maintenance of equipment used

CCFO's

Identifying	Communicating
Working	Demonstrating
Organise	Contributing
Collecting	
Science	

HARVEST PRACTICES

BASIC PREPARATION REQUIREMENTS

The harvesting of produce is the final process in the production cycle, and one of the most important. If the harvest is not well-planned and well-managed, it may lead to damage to produce that has been produced at high cost, especially in the case of fresh produce such as fruit and vegetables. Other produce, such as grains and seeds, are less easily damaged. In the case of livestock, the animals can become stressed and/or damaged during the harvesting/transporting process.

The basic requirements for preparing of the harvesting process are:

Crop estimates
Management
Equipment
Work force

Crop Estimates

The basis for calculating equipment and labour needed to harvest the crop within the normal harvesting/picking period of each cultivar is an accurate crop estimate.
The estimate must, apart from crop volume, also indicate projected size spread per cultivar, external quality and time of ripening.
Internal quality development towards harvest must be monitored from about six to eight weeks before estimated harvesting date to confirm or adjust earlier predictions.

Management

- ✓ Training

  All supervisors and workers must be trained before harvesting to ensure that the correct methods are used during the picking process.

  It is important that both the supervisors and workers are at the same level of understanding of why the picking process must be done in a certain manner and what the negative effects of deviation would be.

- ✓ Quality Management

  Systems must be devised to monitor that the produce is harvested with the correct internal and external quality standards. This dictates that samples must be taken and analysed from well before harvesting, and the quality standards must be monitored up to harvesting.

- ✓ Monitoring Systems for All Actions

  The actual harvesting process must be done as prescribed and must be carefully monitored. It is important that the Eurepgap requirements for information regarding all aspects involved in picking are met.

  These would include training before and during harvesting, produce quality monitoring, rate of harvesting and transport.

Equipment

All the equipment needed for the harvesting process must be examined beforehand to ensure that it is in good condition and that it is sufficient.

Equipment may include:

- Tractors
- Trailers
- Bins, Ladders, Clippers, picking bags and picking gloves for the fruit and vegetable grower
- Mechanised harvesting equipment
- Tools
- Trays
- Crates
- Ladders

Sufficient ablution facilities must be available for the additional workers that are employed during the harvesting period.

Work Force

The number of harvest workers and supervisors required is calculated based on the crop estimate, considering the period in which the harvesting must be completed for each cultivar.

Harvesting Systems

The harvesting system of the enterprise depends on what is being grown what should happen to the produce during harvesting process. For example, there is a vast difference between how fresh apples are dealt with, compared with grains and seeds.

Pre-Harvest Actions:

The pre-harvest actions may (depending in the enterprise) include the following:

- Final estimation of total crop
- Comparing internal and external quality with marketing standards
- Sourcing and training of supervisors and harvesters
- Medical examination of all workers to be involved in the picking operation
- Issuing new overalls to all pickers
- Preparing and cleaning picking equipment
- Harvesting / Picking Process

The harvest / picking process may (depending in the enterprise) include the following:

- Decide which picking method to use, i.e. clippers or snap-picking
- Daily inspection of cleanliness and condition of ladders, clippers and picking bags
- Inspection of fingernails of pickers, which must be short to prevent injuries to fruit
- Ensuring that enough drinking water is available
- Monitoring hygiene standards, e.g. washing of hands after visiting toilet
- Ensuring that turgid (wet from dew, rain or high humidity) fruit are not picked to prevent pressure bruising (oleocellosis)
- Monitoring by supervisors of general picking and handling of fruit from tree to bin
- Inspection of fruit as picking bags are emptied when picking out on colour
- Ensuring that picking bags are emptied carefully so as not to cause injuries to the fruit
- Ensuring that fruit do not have long stems after picking
- Ensuring that bins or trailers are not overfilled before transport
- Monitoring the removal of all fallen and/or decayed fruit from orchards after picking
- Transport to Accumulation Point or Pack house

In the case of produce that can be easily damaged, harvested produce must be transported from the growing area to a pack house at a moderate speed to prevent injuries or bruising. If this is the case then the roads that will be used should be graded to prevent unnecessary

wear and tear on transport vehicles and equipment and can lead to injuries and bruising to the produce.

Transport at high speeds on gravel roads causes dust to settle on the produce which leads to injuries and small injuries can lead to infection by pathogens and resultant in decay.

HEALTH AND HYGIENE PRINCIPLES

Health and Safety

The Occupational Health and Safety Act of 1993 provides for the health and safety of persons at work and when using plant and machinery. It also provides for the protection of persons other than those at work against hazards to health and safety arising out of activities of persons at work.

- Employers

According to the Act, employers have the basic duty towards employees to provide and maintain a working environment that is safe and without risk to the health of the employees.

The matters to which these duties refer include the following:

- Providing and maintaining systems of work, plant and machinery that are safe and without risk to health;
- Taking steps to eliminate or mitigate any hazard or potential hazard to the safety or health of employees;
- Deciding for ensuring the safety and absence of risks to health in the production and harvesting process;
- Identifying the hazards to the health or safety of persons attached to any work which is performed, and devising and applying any necessary precautionary measures;
- Providing such information, instruction, training and supervision as may be necessary to ensure the health and safety of his employees;
- Not permitting any employee to do any work unless the precautionary measures which may be prescribed, have been taken;
- Enforcing such measures as may be necessary in the interest of health and safety;

- Ensuring that the work is performed under the general supervision of a person trained to understand the hazards associated with it and who has the authority to ensure that the precautionary measures taken by the employer are enforced.

- Employees

  Every employee shall at work:

  - Take reasonable care for the health and safety of himself and of other persons who may be affected by his acts of omissions;
  - Co-operate with his supervisor to comply with any such imposed measures;
  - Carry out any lawful order given to him in the interest of health and safety;
  - If any unsafe or unhealthy situation comes to his attention, report it as soon as possible to his supervisor and/or employer;
  - If he is involved in any accident which may affect his health or has caused injury to himself, report the incident as soon as possible;
  - Co-operate with and in safety committees whenever required.

Hygiene

A hygiene risk analysis encompassing, amongst others, harvesting procedures, should be carried out prior to harvesting and processing at all production units.

All actions identified should be communicated to all persons involved in the process through training and must be strictly enforced by supervisors and management. All such actions must be documented and monitored throughout.

The following applies:

- Only healthy people must be involved in the harvesting process;
- Workers must have access to clean toilets and hand washing facilities near their work area;
- Basic verbal and written instructions in hygiene must be given before handling produce, including personal cleanliness including hand washing, wearing of jewellery, fingernail-length and cleaning, and personal behaviour;
- Wearing and care of protective clothing;

- All subcontractors and visitors must be aware of the relevant demands on personal hygiene;
- A trained person in First Aid must be available whenever on-farm activities are carried out;
- The accident and emergency procedures must be clearly understood by all workers.

QUALITY STANDARDS RELEVANT TO THE PRODUCT

Internal Quality Standards

Harvesting produce at optimum maturity is an important factor, especially with regards to perishable produce, as it determines the shelf life of the final product.

In the case of fruit, several parameters, including puffiness, rind-colour, and acid and sugar levels, are used to measure fruit maturity. The parameters are monitored from about four to six weeks before the anticipated date of harvest to confirm that the predicted fruit maturity coincides with the packing period indicated on the crop estimate. It is important to know how maturity is measured for the product that is to be harvested.

It is essential that the internal produce quality complies in all respects with the export requirements before harvesting.

External Quality Standards

A thorough understanding of external standards must be known for the specific commodity; these will vary.

External standards at the time of harvest refer, in the case of fruit, to rind colour, blemishes, deformed fruit and insect damage and diseases. Injuries sustained during picking and transport is also monitored at the pack house as a culling factor.

Rind colour develops further after picking and can be enhanced through de-greening or delaying the fruit before processing at a higher temperature. Practices like these will however detract from shelf life and marketing potential. It is therefore best practice to only harvest fruit with fully developed rind colour.

Blemishes are caused by wind, hail and insects, as well as by implements at an early stage of fruit development. A certain level of blemishes is allowed in export and local market fruit, but obviously non-conforming fruit must be graded out in the orchard. This also holds for deformed fruit.

Pests and Diseases

Pests and diseases usually affect produce long before harvest. Numerous post-harvest diseases result from pre-harvest infections; these should be controlled as per the commodity being produced. The level of post-harvest decay is also influenced by picking, transport and other practices. Correct management of these practices is therefore of primary importance to deliver a highly marketable product to the pack house for processing.

POST- HARVEST PRACTICES

In agriculture, **postharvest handling** is the stage of crop production immediately following harvest, including cooling, cleaning, sorting and packing. The instant a crop is removed from the ground, or separated from its parent plant, it begins to deteriorate. Post-harvest treatment largely determines final quality, whether a crop is sold for fresh consumption, or used as an ingredient in a processed food product. Effective handling decreases postharvest losses.

The most important goals of post-harvest handling are keeping the product cool, to avoid moisture loss and slow down undesirable chemical changes, and avoiding physical damage such as bruising, to delay spoilage. Sanitation is also an important factor, to reduce the possibility of pathogens that could be carried by fresh produce, for example, as residue from contaminated washing water.

After the field, post-harvest processing is usually continued in a packing house. This can be a simple shed, providing shade and running water, or a large-scale, sophisticated, mechanized facility, with conveyor belts, automated sorting and packing stations, walk-in coolers and the like. In mechanized harvesting, processing may also begin as part of the actual harvest process, with initial cleaning and sorting performed by the harvesting machinery.

Initial post-harvest storage conditions are critical to maintaining quality. Each crop has an optimum range for storage temperature and humidity. Also, certain crops cannot be effectively stored together, as unwanted chemical interactions can result. Various methods of high-speed cooling, and sophisticated refrigerated and atmosphere-controlled environments, are employed to prolong freshness, particularly in large-scale operations.

Regardless of the scale of harvest, from home garden to industrialized farm, the basic principles of post-harvest handling for most crops are the same:

- **handle with care** to avoid damage (cutting, crushing, bruising)
- **cool** immediately and maintain in cool conditions
- **cull** (remove damaged items)

Losses of horticultural produce are a major problem in the post-harvest chain. They can be caused by a wide variety of factors, ranging from growing conditions to handling at retail level. Not only are losses clearly a waste of food, but they also represent a similar waste of human effort, farm inputs, livelihoods, investments and scarce resources such as water.[2] Post-harvest losses for horticultural produce are, however, difficult to measure. In some cases, everything harvested by a farmer may end up being sold to consumers. In others, losses or waste may be considerable. Occasionally, losses may be 100%, for example when there is a price collapse and it would cost the farmer more to harvest and market the produce than to plough it back into the ground. Use of average loss figures is thus often misleading. There can be losses in quality, as measured both by the price obtained and the nutritional value, as well as in quantity.

There are numerous factors affecting post-harvest losses, from the soil in which the crop is grown to the handling of produce when it reaches the shop. Pre-harvest production practices may seriously affect post-harvest returns. Plants need a continuous supply of water for photosynthesis and transpiration. Damage can be caused by too much rain or irrigation, which can lead to decay; by too little water; and by irregular water supply, which can, for example, lead to growth cracks. Lack of plant food can affect the quality of fresh produce, causing stunted growth or discoloration of leaves, abnormal ripening and a range of other factors. Too much fertilizer can harm the development and post-harvest condition of produce. Good crop husbandry is important for reducing losses. Weeds compete with crops for nutrients and soil moisture. Decaying plant residues in the field are also a major loss factor.

HEALTH AND HYGIENE PRINCIPLES FOR POST HARVEST PRACTICES

The general health, safety and hygiene principles discussed previously are also applicable for all post-harvest activities.

Transport of produce to and from the fields should not expose any person to possible injury. The tractors, vehicles and forklifts must all be in good condition and the drivers and operators must be well trained and licensed.

Production guides for specific crops will be provided to you by the facilitator, eg:

- Production guide for Maize
- Production guide for Wheat
- Production guide for Sorghum

These guides will give you more information on harvesting practices for each industry.

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