Assessment of Postharvest Practices and Possible Interventions in Tanzania
Assessment of Postharvest Practices and Possible Interventions in Tanzania

This study was conducted by Farm Concern International to assess the postharvest handling practices of small scale farmers in Siha, Hai, Arusha and Meru districts where the Sustainable Market Led Agriculture Management (SMART) Programme funded by CIDA/World Vision Canada focuses on improving production by working across the whole value chain. The findings formed a basis to provide recommendations on practical and appropriate postharvest technologies and practices that can be adopted or improved. The study focused on four crops namely potatoes, carrots, tomatoes and onions.

Performance of tomatoes, carrots, potatoes and onions in the four Districts

There is a need in the four Districts implementing SMART to improve on the productivity of all the four commodities since land and irrigation water is available although, current production as shown in the table below are still below recommended levels.

Production area of Tomatoes, Carrots, Potatoes and Onions in Siha, Meru, Arusha and Hai Districts 2013

<table>
<thead>
<tr>
<th>District</th>
<th>Tomatoes Acreage (Ha)</th>
<th>Carrots Production MT</th>
<th>Potatoes Acreage (Ha)</th>
<th>Production MT</th>
<th>Onions Acreage (Ha)</th>
<th>Production MT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meru</td>
<td>1,697.3</td>
<td>8,061.9</td>
<td>133.0</td>
<td>2,457.8</td>
<td>43.8</td>
<td>808.5</td>
</tr>
<tr>
<td>Arusha</td>
<td>496.1</td>
<td>2,356.4</td>
<td>336.6</td>
<td>6,220.0</td>
<td>363.8</td>
<td>6,722.1</td>
</tr>
<tr>
<td>Hai</td>
<td>273.3</td>
<td>1,297.9</td>
<td>32.7</td>
<td>603.4</td>
<td>19.3</td>
<td>355.7</td>
</tr>
<tr>
<td>Siha</td>
<td>230.2</td>
<td>1,093.5</td>
<td>161.5</td>
<td>2,984.5</td>
<td>314.1</td>
<td>5,804.2</td>
</tr>
<tr>
<td>Totals</td>
<td>2,696.8</td>
<td>12,809.7</td>
<td>663.7</td>
<td>12,265.7</td>
<td>740.8</td>
<td>13,690.5</td>
</tr>
</tbody>
</table>

Tomatoes occupied the largest area of 2,700 Hectares (Ha) followed by Onions having 811Ha. Potatoes and Carrots each occupied 741 and 664 Hectares, respectively as shown in the table above. In terms of potatoes production, Arusha and Siha Districts are leading in production accounting for 91% of the Potatoes produced in the project area. Arusha District had the highest production of carrots accounting for 40% of carrots produced in the project area followed by Meru and Siha Districts having 20% and 24%, respectively. Hai and Meru District are leading in Onion production accounting for 65% of the Onion production in the target Districts while Meru District is the main producer of Tomatoes accounting for 63% followed by Arusha District with 18%. Based on the aforementioned, proposed interventions in the value chain should be implemented according to productivity in the Districts as shown below:
Productivity of these crops can be enhanced by use of the right varieties and utilisation of appropriate inputs. In addition, proper postharvest methods have to be used to ensure all harvested products are not wasted.

**Key findings on the postharvest handling structures in the target Districts**

The study used a value chain analysis approach to evaluate the appropriateness of the activities conducted along the chain to make appropriate recommendations. Basic principles regarding food safety standards were also considered along the supply chain regardless of the crop.

**Farm level postharvest handling structures**

It was established that traders collected 90% of their produce from the farmers directly. This was convenient for the traders because of the proximity of the farms and similarity of the produce being produced within a village.

**Sources of produce for Traders in the project area**

![Pie chart showing sources of produce for Traders in the project area]

Source: Farm Concern International (FCI), VEMAC Value Chain Analysis, 2015

Though preference was in collecting directly from farmers, approximately 92% of the farmers stated they lacked postharvest handling facilities. The implication is that there is lack of produce handling amenities like crates, grading surface and drying equipment among others. This greatly affects standardisation of produce quality and quantity as handling and packaging is done subjectively by the farmers and traders. The Commercial Producer Groups (CPGs) lacked collection centres according to 98.6% of the farmers implying that farmers sold individually to buyers. Nevertheless, there existed open collection points besides the farm for sorting and grading tomatoes while onions, potatoes and carrots were at times graded on the farm as harvesting was on going. There were collection centres present for potatoes and carrots by the roadside of some villages in Siha district that were set up by the traders. These collection points were in the open and produce was exposed to high temperature which affected the quality and reduced the produce shelf life.

**Transport mode for produce**

According to the survey, hired vehicles were used by 94% of the farmers to ferry produce from the farm to the collection centre and the wholesale market. The vehicles were either pick-ups or trucks with capacity ranging from 3 to 8 tonnes. Important to note is that push carts and Boda Bodas (motorbikes) were used to carry small quantities and formed vital means of transport during the rainy season when the roads leading to the farms were impassable.
According to the survey, 90% of Traders dealing with the four commodities in the project area sourced their produce from individual smallholder farmers once a week. Though 99% of the CPGs lacked collection centres, it was observed that traders of potatoes and carrots established collection points within a radius of 10Km from the farms while some collected produce from individual farmers directly. Tomato and onion buyers also collected from a number of farms to fill up the trucks in a pre-arranged manner. The establishment of a collection centre for the CPG will assist farmers to benefit from economies of scale associated with bulk marketing in addition to training.

**Use of poor containers**
It was observed that the wooden crates used to for tomatoes in Kawaya village were unlined exposing the crop to mechanical damage on the commodity. However, in some cases like Arusha, there were traders using buckets which have a smoother surface though they also have their limitations; the piling of the tomatoes cause depressed marks on the commodity and the buckets don't provide aeration. Handling produce was done without proper protective clothing which poses a risk of contaminating the product by the produce handlers. The use of plastic bags to pack carrots, potatoes and some instances onions was observed in Ngarenairobi village in Siha District and Kawaya Village in Hai Districts, respectively. The use of plastic bags is known to limit aeration causing rot and decay in produce.

**Poor postharvest handling practices**
There were poor postharvest techniques that were observed in Hai and Siha Districts. Curing of onions in Kawaya village and potatoes in Ngarenairobi was not done as is required for the two crops. Carrots and tomatoes on the other hand were packed with dirt. Onions were observed to have thick necks which were as a result of the pre-harvest conditions while potatoes were not cured. It was also reported during Focus Group Discussions (FGD) that crates of tomatoes were heaped one on top of the other, causing mechanical injury on the tomatoes at the bottom of the pile. These are issues which require to be addressed through capacity building of farmers and traders.

**Rejects in the farm**
There lacked storage facilities at the CPGs which contributed to wastage in farm produce particularly tomatoes. There were rejects particularly in carrots and tomatoes due to poor quality products and unplanned production as was informed during the FGD and observed in Arusha. Broken Carrots were rejected which was caused by poor method of containerisation and transporting while forking was attributed to pre harvest factors like high moisture levels. Tomatoes had high levels of field losses during off peak seasons where a high number of the produce was left in the field.
Poor farm management practices

It was established in Ngarenairobi and Kawaya villages that prices for potatoes and tomatoes respectively, were conveyed verbally to the farmers by buyers without negotiation. The farmers are therefore price takers, there is need for the farmers to gather information from other buyers and markets as well as analysing the costs incurred and negotiating with the buyers in order to make a more informed choice when it comes to pricing. In addition, there lacked farm records which are necessary to keep track of productivity and profitability of any business lack of which hinders improvement since areas of weakness cannot be established easily.

These poor practices were attributed partly to inadequate knowledge by the smallholder farmers and traders on the handling requirements for these crops and facilities required to minimise losses a key finding during the focus group discussions. Interviews with Government extension officers showed that, though 91.4% had knowledge on postharvest handling practices, the information was not passed to farmers due to lack of resources. Approximately 100% of the farmers in the project area had not been trained on postharvest handling.

Field handling of Onions

Production of Onions was done on an average of 1-1½ acres under irrigation as a standalone crop and was grown in rotation with maize or beans. The common variety of onion grown was Bombay Red. Farmers reported to harvest an average of 60 bags weighing approximately 110 Kgs. The price of Onions ranged from USD40 during the glut period (June to September) to USD 75 at peak seasons.
As depicted in Figure 1, Meru and Arusha Districts had similar numbers of farmers growing onions; 233 and 234 farmers, respectively. Hai had the highest number of farmers growing onions having a total of 317 while Siha District had the least number. The villages which grow onions include Mkalama, Kawaya and Chemka in Hai district. The village with the highest production of Onions in Arusha District is Mang’ola but the village is not within SMART project area therefore not considered in this study. Interventions for post-harvest handling were targeted at the three Districts; in Hai district and consideration was made to boost production in Meru, Siha and Arusha Districts.

Postharvest interventions for Onions

Ideally, after harvesting Onions, the leaves and roots are clipped and initial sorting is done to remove undersize, deformed and hollow stemmed bulbs. The Onions should be cured and properly dried before packing or storing. Drying is important because it reduces shrinkage during subsequent handling, reduces the occurrence of sprouting, and allows the crop to ripen before fresh consumption or long-term storage. This process of dehydration is sometimes called ‘curing’. Drying reduces bulb weight and since they are sold mostly on a weight basis, achieving the desired level of dehydration is critical. Weight losses of 3-5% are normal under ambient drying conditions and up to 10% with artificial drying (Opara, 2003). Properly dried Onions have tight necks and the skins easily slip off when held in the hand.

Onion on farm curing rack
For small-scale farmers in Mkalamu, Kawaya and Chemka villages of Hai District, onion drying can be carried out in the field through windrowing for 1 or 2 weeks. The bulbs should be windrowed in such a way to reduce the exposed surface to damage due to direct exposure to the sun. Alternatively, the harvested Onions can be dried on rust proof galvanised mesh under a shade or wooden poles arranged as racks. The width of the drying rack should be approximately 46” for ease of working. The length of the drying rack depends on the farm capacity. The bulbs can also be dried by tying the tops together in groups, which are then hung over poles with the neck facing up in sheds to dry naturally.

**Recommended Packaging of Onions**

Before packing of onions, grading should be done according to size. They are graded into grades 1, 2 and 3 with grade 1 being superior. It is recommended that onion producing villages in Hai use Jute bags for holding the bulbs that need to be marketed immediately. The disadvantage is the bag is too large - may contain 100 kg onions, hence difficult to handle and an increased risk of mechanical damage. To avoid these problems, open-mesh nets (see photo on the side) available in 12.5 and 25Kg sizes are widely used packages for onions destined for storage because of their ventilation ability and provide a means of displaying legally and commercially required information. Jute bags can also be used to transport the bulbs from the field to the store but not hold them during storage. Because of the murram roads in Hai that cause vibration of the transport vehicle, the packaging should be strong enough to minimise mechanical damage of Onions under those conditions. In this regard, the mode of transport used should be lined with dry leaves if the floor is hard surface.

**Interventions for storage of Onions**

An improved low cost structure made of wooden planks or offcuts as a wall and a roof that is corrugated or thatched with jute as ceiling can be constructed for use by individual farmers. The floor should be raised to guard against rodents. To note is that one cubic meter area of store accommodates 750Kg of Onions.

**Features of individual onion storage structure**

- Construction of structures on a raised platform with bottom ventilation to prevent moisture and dampness by avoiding direct contact to bulbs with the soil.
- Increased center height and more slopes for better air circulation and preventing humid microclimate inside go down.
- Bottom ventilation provides free and faster air circulation to avoid formation of hot and humid pockets between the onion layers.
- Providing cubicles instead of continuous stacks and sufficient space for ventilation for all sides.
- Avoid direct sunlight or rainwater splashes falling on onion bulbs to reduce sun scald, decay fading of color and quality deterioration.
- Restriction on width of each stack to 60-75 cm for cool humid weather, 75-90cm for mild and humid weather and 90-120 cm for mild and dry weather conditions.
- Restriction of stacking height to 100 cm for small and multiplier onion and hot weather and 120 cm for mild weather and for big onion to avoid pressure bruising.

Intervention for the CPGs is a central store that allows free ventilation and is recommended to be set up in each of the villages producing onions in Hai District to hold the product in preparation for marketing when prices are low. The store will serve as a collection point for buyers and will allow intermittent sales depending on the prevailing price.
The dimension of the onion storage structure is 5m wide, 8m long and 3m high. The layout of the store is such that the length is against the wind direction and depending on the way the Onions are brought into storage (loose or in a net). A shelf should be used if the bulbs are stored loosely and a galvanised meshed rack is used if the Onions are stored in nets. The shelves are slated on the sides and underside to allow for ventilation. The roof should be 1.5 times higher than the level of Onions to allow free flow of air. The onions in the shelf are regularly monitored to check for rots and sprouting. The advantage of using nets for packaging is that they provide ventilation of the bulbs and because the net is transparent and quantities small, monitoring can be done through the openings of the nets. Storing in nets allows for labelling of each farmer’s produce. The floor of the store is made of concrete for ease of cleaning and also maintaining low temperatures.
Farm Concern International, Africa Office
P.O Box: 15185-00100, Nairobi, Kenya.
Tel: +254-20-262 6017 | 254-20-262 6018
Address: KALRO Campus, Waiyaki Way
Website: www.farmconcern.org
Email: info@farmconcern.org

© @farmconcern

Winning Markets for Africa!