RESEARCH PROGRAM ON Roots, Tubers and Bananas

Training report:

Enhancing ware potato storage

Critical steps in pre and post-harvest and storage management of potato in field for best ware quality

Expanding Utilization of Roots, Tubers and Bananas and Reducing Their Postharvest Losses

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Buginyanya Zonal Agricultural Research and Development Institute

www.rtb.cgiar.org

A broad alliance of research-for-development stakeholders & partners

RTB-ENDURE is a 3 year project (2014-2016) implemented by the CGIAR Research Program on Roots, Tubers and Bananas (RTB) with funding by the European Union and technical support of IFAD.
http://www.rtb.cgiar.org/endure

The CGIAR Research Program on Roots, Tubers and Bananas (RTB) is a broad alliance led by the International Potato Center (CIP) jointly with Bioversity International, the International Center for Tropical Agriculture (CIAT), the International Institute for Tropical Agriculture (IITA), and CIRAD in collaboration with research and development partners. Our shared purpose is to tap the underutilized potential of root, tuber and banana crops for improving nutrition and food security, increasing incomes and fostering greater gender equity, especially among the world's poorest and most vulnerable populations.

Table of Contents

List of Acronyms

BugiZARDI	Buginyanya Zonal Agricultural Research and Development Institute
CGIAR	Consortium of International agricultural Research Centers
CIAT	International Center for Tropical Agriculture
CIP	International Potato Center
CIRAD	French Agricultural Research Center for International Development
IFAD	International Fund for Agricultural Development
IITA	International Institute for Tropical Agriculture
KACOFA	Kapchorwa Commercial Farmers Association
MIFA	Mengya Integrated Farmers Association
MPODA	Mbale Potato Dealers Associaiton
NARO	National Agricultural Research Organization
SHA	Self Help Africa
WASWAPA	Wanale Seed and Ware Potato Producers Association

Background

Potato is one of the fastest growing major food security crop in the developing world with important economic impact on many resource-poor farming families. In Uganda many factors limit production and profitability, with hundreds of millions of shillings spent yearly on fungicides alone, but little is known about direct losses, with experts agreeing that they are variable and frequently significant. It is estimated that 82%, 71%, and 61% of potato grown in Kenya, Uganda, and Ethiopia, respectively, are for sale and the farming systems are quite intensive and diversified (Gildemacher, 2012). In Uganda, losses caused by diseases such as late blight (*Phytophthora infestans*) are high, ranging from 40% to 60% of the total production and can reach 100% if infection occurs early in the season when climatic conditions are favorable for disease development. According to Okonya et al. (2016), the constraints to potato production and marketing as ranked by stakeholders include diseases as the most important, followed by insect pests and price fluctuation for ware potato was ranked the third most important constraint. Low market prices for ware potato was at fourth, late maturity and short dormancy of some potato varieties, tuber damage by rodents and tuber damage by millipedes were also reported.

Seed potato is the most significant constraint to profitable potato enterprise and yet access to quality seed is limited. The potato enterprise in Eastern Uganda is further constrained by the varieties of potato grown which do not attract premium price in urban markets. The growing of market demanded potato varieties is key to ensuring improved household incomes. This has to be supported with good agronomic practices that are efficient and ensure good quality of ware for the market. Ware potato production in Uganda is characterized by inconsistent supply which is dependent on seasonal harvests, poor handling, high moisture content, bruised skins, poor packaging and transportation. More importantly from scoping studies, it was shown that there are no attempts to store the surplus appropriately. This translates into low prices during times of surplus and price spikes when supplies drop. The introduction of ware potato storage facilities coupled with high value potato varieties and good farming and postharvest practices would ensure sustained access to the market. The "Expanding Utilization of RTB and Reducing Their Postharvest Losses" (RTB-ENDURE) project has introduced ambient storage to the potato producing areas in eastern Uganda. This being a new innovation, stakeholders' capacities for proper ware potato postharvest and storage management need to be strengthened. Very careful handling is the key to preventing damage. Harvesting is best done when the soil is slightly moist to prevent abrasion and the tubers lifted carefully to avoid damage. Ideally they should be left to dry for few hours in the field, collected in field containers and placed in a cool, shady place. Suitable temperature and limited tuber damage are the two most important factors in successful potato storage. Potatoes for food (ware potatoes) must not be exposed to light for more than a few hours otherwise they turn green, develop an unpleasant taste and may become toxic.

Potato storage is a critical component of the potato production process, with some crops potentially spending longer in storage than they do in the ground. The situation in stores is dynamic; the crop is respiring and reacting to its environment. Store operators must have the capability to respond to this change to optimize conditions in the store and maintain quality throughout the storage period.

Obtaining the optimum postharvest quality of potato actually begins very early in the farm planning process. The effects of pre-harvest factors on postharvest quality are often overlooked and underestimated. However, many of the decisions that we make during crop production can greatly influence the postharvest quality of crops. It is critical to consider that in potato, like other vegetables, quality can be only maintained postharvest – it cannot be improved during the harvest and storage processes. Thus, it is of utmost importance to consider the pre-harvest factors that allow us to maximize the postharvest quality of the potato, including its storability. These factors encompass production and management decisions concerning soil fertility, variety selection, irrigation, and pest management.

This reports presents the training activities that have been undertaken by the RTB-ENDURE project in order to ensure that farmers, particularly the ones hosting the pilot storage facilities, have the required skills and capacities required to successfully manage the stores and enhance the profitability of potato marketing.

Training objectives

1. Participants are knowledgeable on improved pre-harvest management practices
2. Participants are aware of proper ware potato post-harvest handling practices
3. Participants' are sensitized on ware potato storage management methods

Methodology

A modular approach was used to conduct the trainings. Participatory learning and action methodology was used for delivering most of the subjects. Module 1: 'Best practices in potato pre-harvest management' and Module 2: 'Best practices in potato post-harvest handling'. Each module was covered on separate days then participants supported with follow up visits to the fields during the potato season (Table 1). Participants were drawn from each association supported by the project and workshops conducted within their locality. Technical personnel from Buginyanya ZARDI provided the backstopping during the discussions. Practical sessions were held with each group in fields nearby the workshop venue. The discussions where based on participants own experiences then the experts would introduce and discuss innovations and best-practices. Innovations such as localized weather prediction combined with scouting for disease symptoms to regulate use of agro-chemicals, attending field days in Kitale, Kenya and using information on their farms especially in seed potato on-farm production are key to agricultural development. Realizing the potential of agricultural innovations requires research and extension systems and other knowledge institutions to be stronger and better connected with each other and with farmers and their organizations.

Table 1: Table showing association participation and specific training workshop dates

ASSOCIATION	WORKSHOP DATE	LOCATION	NUMBER OF PARTICIPANTS	
			FEMALE	MALES
KACOFA	12th January 2016 (Pre-harvest training)	Kapchesombe	6	8
	1st March 2016 (Post-harvest training)	Kapchesombe	10	5
MIFA	13th January 2016 (Pre-harvest training)	Mengya centre	5	8
	2nd March 2016 (Post-harvest training)	Mengya, FHI	7	10
WASWAPA	14th January 2016 (Pre-harvest training)	Wanale centre	4	10
	3rd March 2016 (Post-harvest training)	Wanale Baptist church	15	10
MPODA	4th March 2016 (Post-harvest training)	Bugwere Market	4	11
Total			**51**	**62**

Module 1: Best practices in potato pre-harvest management

Potato variety selection

Producers should select varieties that are suitable for their location and for a targeted market. The popular marketable varieties in Uganda include Victoria, Rwangume, Rutuku, Kinigi, and recently released NaroPot1, NaroPot2, NaroPot3 are currently suitable for dual purpose (fresh consumption and processing) while Nakpot5, Kachpot1 and Wanale/Cruza are suitable for boiling only.

Seed potato quality

To obtain good seed potato, it is advisable to acquire seeds from a certified source, research station or established potato seed producers. Fields for seed potato production should be of a single variety produced in solanaceous crop free locations. Producers can use the positive and negative seed selection techniques for bulking of clean seed. The seed should then be stored in diffused light stores or modified farmer methods such as covering with grass for proper sprouting. The seed potato contains buds or "eyes" which sprout and grow into plants. Good seed is characterized by having at least one good “eye” of egg size or 40-80mm. Seed potatoes (about 40,000 seeds/ha) are graded into two sizes, 35–45mm or 45–55mm. Seed potato should be carefully transported in jute bags or other suitable material but not polythene to avoid damage to the sprouts. Properly select the healthy sprouted potatoes and remove any rotten ones and dispose of them properly (Figure 1). Producers can also use small seed plot technique for seed potato production especially if quantities are limiting.

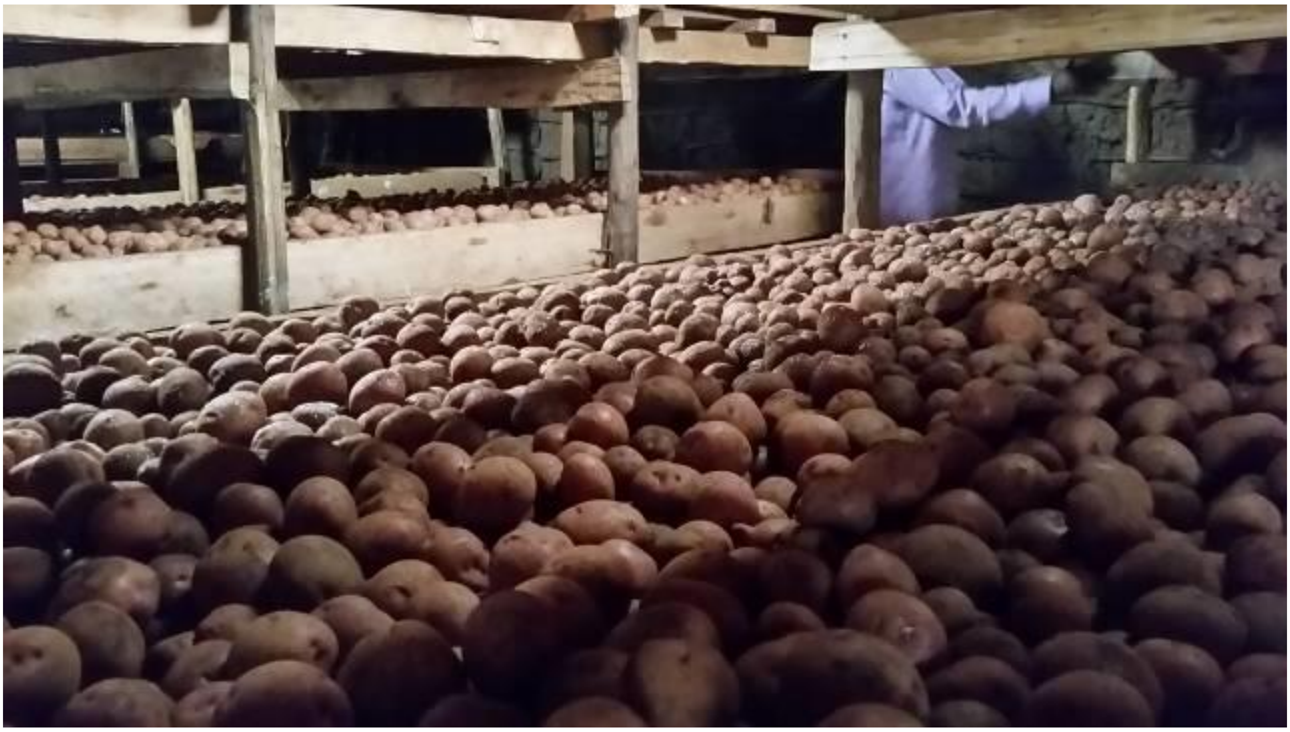

Figure 1: Seed potato in a locally made diffused light store in Benet, Kween

Field preparation and management

A field with no history of potato production for the past three seasons and not adjacent to any solanaceous crops is most ideal for current season’s production. The land should have well drained sandy loamy soils, pH 5-6 and stone free. It should be ploughed two times with intervals of two weeks to clear out all the previous crop.

Potatoes grow best on raised beds which are made during initial land preparation or immediately after planting. Adoption of raised beds or gradually hilling during weeding after planting as the crop grows lead to improvements in soil moisture, temperature, adequate aeration and drainage which is a vital ingredient for potato growth.

Organic manure should be spread in the field during levelling. Apply one bag of inorganic (NPK) fertilizer for every four bags of seed potato planted which is equivalent to a rate of 300kg/hectare in the ridges during planting.

Seed potato should be placed 10cm below surface of ridge, 60cm apart between rows and 30cm from tuber to tuber in a row. The seed should then be earthed up to make ridges of 25cm depth. This can be done using a planter or oxen with mouldboard plough. Preferably plant a few days before the rains start in late March and early August then, if you can irrigate, plant also in early November.

Crop should be earthed up at first weeding to cover the roots fully. Earthing up protects the crop from light, light exposure causes greening of tubers and leads to alkaloids (poisonous) formation (Figure 2). A second weeding using a selective herbicide should be done at 60 days after planting. Crops should be sprayed when 15-20% of potato plants are visible above soil, spray should be a mixture of total herbicide and residual herbicide of medium resistance. The total herbicide kills the potato tips but they recover and continue growing. In field the crop should be uniform at flowering with all off types rouged out.

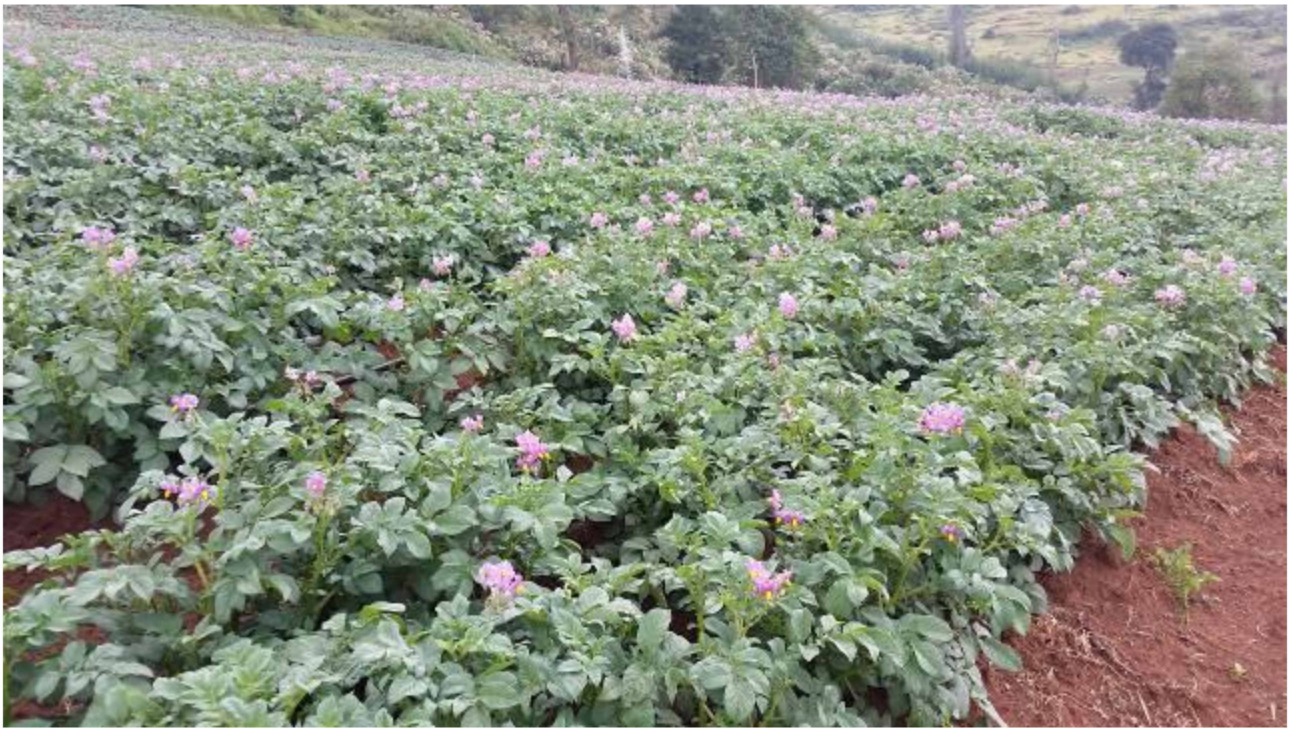

Figure 2: Well maintained and earthed up healthy field shown to groups in Kapchorwa

Pest surveillance and management

The crop should be regularly monitored for aphids, cut worms, leaf miners and other insect pests. Aphids are a major pest in all farming systems. They usually feed by sucking the sap of a plant through the plant veins. All parts of a plant are vulnerable to aphid infestation. Potatoes can be infected by many different viruses transmitted by aphids and thrips. These can reduce yield and tuber quality. Virus diseases can often be diagnosed by mosaic patterns on leaves, stunting of the plant, leaf malformations, and tuber malformations. The best strategy to control viruses is to use certified seed potatoes, spray insects with mineral oils and pesticides applied at frequent intervals to be effective. Infected plants can serve as a source of inoculum for the rest of the field, so rogue (pull out and dispose of) symptomatic plants. Early detection and monitoring of initial aphid build-up is important. Spraying should only be done when the aphid population is heavy.

Potato tuber moth (PTM) or tuberworm (PTW)

Foliar injury is due to the larvae (tuberworm) mining into leaflets, causing them to form transparent blisters, then move into stem tissue causing death. Tubers are marred when larvae burrow through cracks in the soil to a tuber, entering it through the eye. This is common after vine desiccation. The female PTM lays its eggs directly on exposed tubers at or near the eye. A tunnel can be detected by mounds of worm excrement (frass) appearing black at the entrance. Tunnels do not heal and are entryways for diseases most notably soft rot and dry rot.

Disease surveillance and management

Late blight (LB)

Planting of seed tubers latently infected with Late blight (LB) contributes significantly initiating the disease at field level. LB is most rapid during conditions of high moisture and moderate temperatures (15°-25°C). The disease attacks leaves, stems and tubers. The disease consists of small, pale to dark green spots that change into brown or black wounds, depending on the humidity of the air. Under conditions of high humidity and cool temperature, lesions look water soaked and expand rapidly. It is more damaging during cool, wet conditions. It can affect all plant parts. An infected potato tuber has irregularly-shaped and slightly-depressed brown to purplish lesions on the skin surface (Figure 3).

Management: The most commonly-used fungicide, Mancozeb, is effective when applied before the onset of the disease then a systemic insecticide such as Ridomil should be used if symptoms persist. However, most farmers apply fungicides after seeing symptoms. The current farmer practice (6 sprays beginning 30 days after crop emergence) slightly increases potato yields but a weekly scheduled spray program with surveillance (6 sprays) can produce a significant higher yield increase (Namanda et al., 2004).

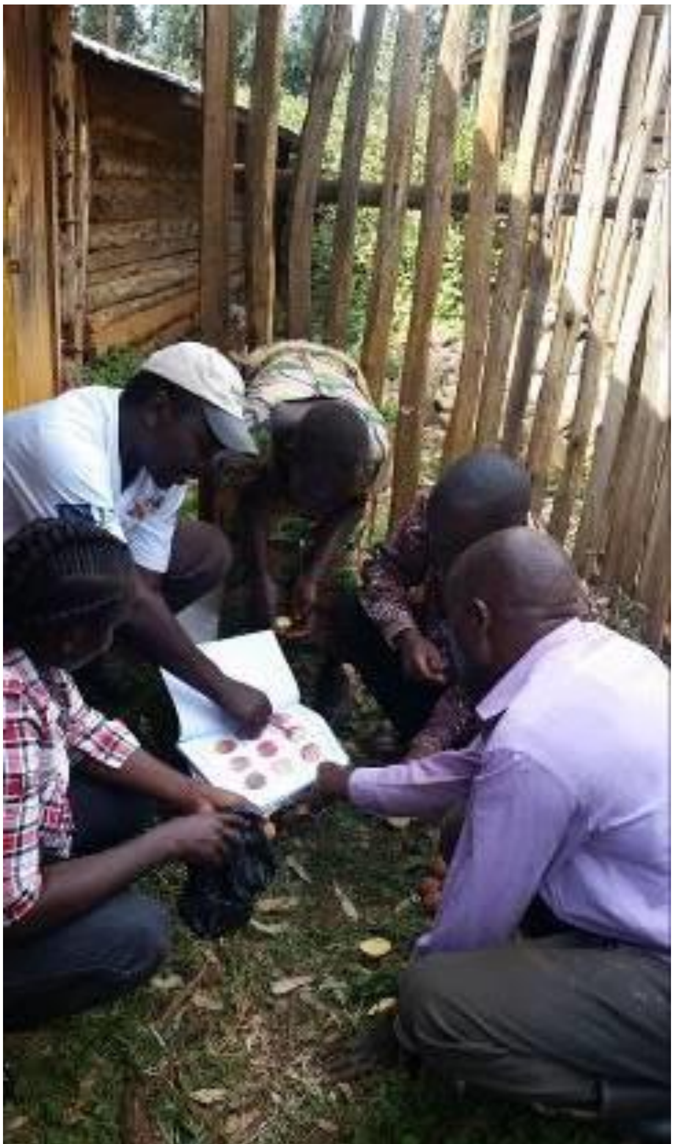

Figure 3: Showing documented disease symptoms on potato picked from farmers' field

Bacterial wilt (BW)

This is spread by field infected seed and contaminated soils. The first visible symptom is a wilting of the leaves at the ends of the branches during the heat of the day. As the disease develops, a streaky brown discoloration of the stem may be observed on stems 2.5cm or more above the soil line, and the leaves develop a bronze tint.

Management: BW can be managed if various control components are combined. This will involve mainly the planting of certified/healthy seed in clean and fertile soil, combined with rotation with non-susceptible crops, and the application of various sanitation and cultivation practices.

Dehaulming

The practice of dehaulming is defined as pulling/cutting of haulms/aerial parts by hand/sickle or killing by chemicals or destroying by machines. This is done after randomly checking the size of tubers, rubbing the skin to check if it is mature at approximately 75-90days after planting depending on the variety and when the aerial part of the plant turns yellow due to senescence or should be done at least 14days before harvesting the potato. The purpose of dehalming is to thicken the tuber skin which then hardens and leads to less bruising and scratching on harvesting, prevent infection of tubers by Late blight or viruses through aphids, and reduce internal moisture content for longer shelf-life. The cut haulms should not be left as such in the field. It should be observed that there is no re-growth of stems after dehaulming as tender and succulent leaves are more attractive to aphids.

Module 2: Best practices in potato post-harvest handling

Field assessment for maturity

The crop is said to be physiologically mature when more than 70% of the flowers have dried and dropped off and 50% of the stems are steadily drying up.

Harvesting and storage management of wares

The dehaulmed potato should be harvested using equipment and methods that minimize damage to the tubers. Harvesting should be done when the weather is sunny with no chances of rain. The ground should be moist but not wet. This allows for tubers to be lifted with minimal skin injury and yet the soil does not stick to the tubers. This can be done using ox-drawn digger or tractor lifter as recommended by Wasukira et al. (2016). Always harvest the clean unmarked areas first and leave the pegged areas/diseased lots for later harvesting for immediate consumption and not storage. At harvest, tubers are liable to considerable skinning, bruising and other damages, which subsequently lead to rotting if not handled properly (Figure 4).

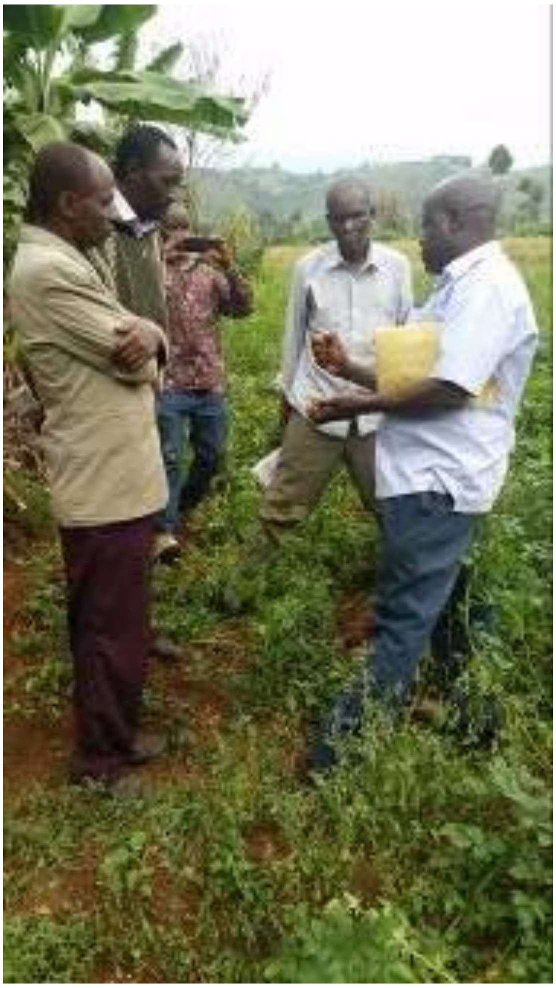

Figure 4: Trainer explaining field assessment of potato maturity to store managers in Kapchorwa

Field sorting, grading and curing harvested potato

The harvested potato should then be placed on tarpaulin in a shade, sorted and graded into damaged tubers, marketable tubers and small tubers (Figure 5). Each of these lots should be weighed and the sum recorded per lot. If there is no threat of rain, the potato can be left for a day under shade and minimal light for curing purposes. Potatoes to be stored need to be cured to repair any skin injuries and to promote the formation of a stronger epidermis to reduce water loss. The optimum conditions for curing potatoes are: Temperature: 15°-20°C, Relative humidity: 85%-90%, Duration: 5-10 days (FAO, 2006). Curing should be carried out near the place where the tubers will be stored to minimize handling after curing. Always dry the harvested tubers quickly to remove excess moisture from the surface for improving their keeping quality. Always dry the harvested tuber in storage shed, exposure to sunlight causes the greening of potatoes. Do not store the tubers immediately if they are exposed to rain after harvest.

Farmers achieve these conditions in two ways:

Above ground. Tubers are carefully piled on the ground and covered by a layer of grass at least 15cm thick and finally a canvas tarpaulin or jute bags are used to cover the whole pile. Plastic sheets should not be used and the curing pile should not be exposed to direct sunlight. The cover should be removed after 2-4 days (Knoth, 1993).

Pit-curing. It consists of a pit, approximately 2.5 x 1.5 x 1 meter with the bottom lined with sawdust or dry grass. The potato tubers are placed on this lining and then covered with a thin layer of soil. The treatment takes about two weeks after which the tubers can be removed for storage. Both of these curing methods are dependent on high temperature and high relative humidity. Because these conditions also favor the development of fungi and bacteria, it is advised that prior to curing the tubers are treated with lime wash or wood ash, or if available, an appropriate fungicide such as Thiabendazole or Benomyl (Demeaux and Vivier, 1984). After curing the tubers should be handled with care to avoid new injuries.

Figure 5: Farmers displaying marketable sized tubers in Wanale

In store management of tubers

The basic principles of potato storage

In order to get the highest market prices, the quality of potatoes offered for sale need to be protected, and postharvest handling, storage and transport must be such as to maintain quality to the highest standard possible. Ware potato storage is aimed at obtaining the maximum quantity of tubers, of acceptable quality to the consumers, at a rate to meet consumer demand. This requires the lowest possible quantitative and qualitative losses, with no or little sprouting, kept in the dark to prevent greening and firm tubers, all at an economical cost (FAO, 2004).

Low storage temperatures, high relative humidity and adequate air flow are the main requirements for potato storage. Storage facilities must be designed to meet the minimum requirements if tubers are to be stored for periods of three months or more. Ware potato storage aims at preventing "greening" (the buildup of chlorophyll beneath the peel, which is associated with solanine, a potentially toxic alkaloid) and losses in weight and quality. The tubers should be kept at a temperature of 6 to 8°C degrees, in a dark, well-ventilated environment with high relative humidity (85 to 90 percent).

Potato variety should be known so as to pre-determine the expected storage length. The variety of potato best for storage is one with a long dormancy. This allows for delayed sprouting and thus better quality after preservation. The crop should be free from diseases, damage or insect infestation.

Temperature influences the rate of respiration of the tubers, sprout growth and the development of microorganisms causing rotting. Most disease organisms multiply very rapidly at high temperatures. Lower temperatures reduce the possibility of disease incidence during storage. This is done by building stores using materials with good insulation properties.

Relative humidity is a factor that influences/affects the rate of water loss from the tubers. The relative humidity within the store should be kept at sufficiently high levels to reduce water loss from the tubers.

Packaging of the tubers in store should be such that it maximizes air circulation and therefore reduces heat buildup which can lead to rotting. The tubers should be stored in wooden crates, jute bags or on wooden pallets off the walls and ground. Always have sufficient space to walk through the store for regular inspection.

Store sanitation is of great importance at end of each lot or before placing a new lot into the store. Clean the store well with water and disinfectant to kill off any fungus or pests from the previous lot. Always apply a residual spray of a general insecticide such as Cypermethrin to the empty store just before harvest to kill any moths in the store.

Well cured potato should be properly parked for storage in an appropriate ware potato store. At farmer level use of improved wooden stores is recommended while large associations can use the ambient stores. The well sorted and graded cured potato should be piled in wooden boxes, jute bags or piled on the floor away from the walls. The potato should be periodically checked for any signs of diseases and pests damage or rotting. The air vents should be properly managed to ensure proper internal temperature and relative humidity to maintain the quality of ware potato. Opening of the store should be limited to avoid sprouting due to light exposure and contamination of the tubers.

Storage options are variable depending on the expected duration, quantity and ability needed for their construction. The four factors to be considered when choosing a potato storage design include style of structure, insulation, ventilation and costs. The most common methods of storage include storage in a cool dark room in the house and storage in pits. The two methods are low cost but store limited quantities and for a shorter period. Another traditional but more expensive storage method consists of a structure made of mud and bricks or well-seasoned timber. Walls are typically from 2.5 to 3.5m high and 3 to 5m wide. Storage period is normally for 5 months. Roofs consist of local matting, wheat/barley straw, and iron sheets with a false ceiling.

Large-scale potato storage can include ambient stores that run on natural circulation and cooling (such as the ones introduced by RTB-ENDURE in eastern Uganda) and cold stores for much longer storage periods. Long-term storage requires to: - introduce air at 16-18°C for five days to stimulate wound healing, b) maintain a high relative humidity to maintain wound healing and prevent drying out, c) reduce temperature gradually to the appropriate holding temperature by removing the heat of respiration, and circulating cool, fresh air through the crop

Record keeping for ware potato in storage

Record keeping is essential to management of the store and the stock therein. Records should be regularly kept to help management in decision making and also for maintenance of the infrastructure. Records such as date of harvesting, names of owner, variety, source of stock, price at harvest, quantity stored, quantity damaged, quantity sold and price at time of sale. All records as recommended by Self Help Africa (SHA) have to be adhered to.

Working group outputs

a) Participants knowledge of potato varieties and quality seed production enhanced since at all sites they immediately selected an individual whose potato they would use as seed in the coming season.

b) A set of criteria to follow for pre-harvest management of potato for good ware potato quality in storage were agreed as per training given to be monitored by the chairman of the association.

c) Joint monitoring of implementation by the association's committee on quality was also proposed but not fully agreed due to logistical constraints.

Conclusion

The training sessions achieved the objectives of introducing proper field potato management and post-harvest management for improved ware potato for storage. Its timing however was not convenient for most participants as it fell when a lot of field operations were taking place thus limiting the attendance for some associations. Better approach should be scheduled by using the Farmer Field School methodology for enhanced learning. Demonstration gardens are also essential to appreciate the effects of poor management on the quality of ware potato for storage. It was also noted that although SHA had introduced the concepts of record keeping and business planning, the associations would require additional support for ensuring successful potato production, storage and marketing.

ANNEXES

Annex 1. Training program

Module 1: 'Best practices in potato pre-harvest management' and

Time	Topic	Responsible
08.15-09.45	Travel to the venue and mobilization	Facilitator
09.45-10.00	Self-introduction and purpose of the training	Mr. Wasukira
10.00-11:00	Preparation of seed potato for field planting	Dr. Owere
11.00-12.30	Field management practices	Mr. Wasukira and Mr. Wobibi
13:00-14.00	Lunch	
14.00-16.30	Field practice	Mr. Wobibi
16.30-17.00	Discussions	Mr. Wasukira
17.00-17.15	Wrap up for the day	Chairperson
17.30	Close	

Module 2: 'Best practices in potato post-harvest handling'.

Time	Topic	Responsible
08.45-09.45	Introduction of members	Chairperson of Group
09.45-10.30	Purpose of the training	Potato coordinator
10.30-11:00	Coffee break	
11.00-12.00	Field activities before harvest	Mr. Walimbwa
12.00-13.00	Post-harvest practices	Mr. Wobibi
13:00-14.00	Lunch	
14.00-15.30	Storage management	Mr. Wasukira
15.30-17.00	Field activity	All
17.00-17.30	Wrap up for the day	Mr. Wasukira
17.30	Close	

Annex 2. List of participants for pre-harvest, post and storage management trainings

No.	Name	Farmers' association	Gender
1.	Kiptala Moses	Benet-MIFA	M
2.	Cheptai Alex	Benet-MIFA	M
3.	Chemutai Juliet	Benet-MIFA	F
4.	Lawendi Stephen	Benet-MIFA	M
5.	Chele Alex	Benet-MIFA	M
6.	Chelangat Philis	Benet-MIFA	F
7.	Cheptoris Betty	Benet-MIFA	F
8.	Cherop Immaculate	Benet-MIFA	F
9.	Chepkurui Fred	Benet-MIFA	M
10.	Bosei Micheal	Benet-MIFA	M
11.	Chelangat Fred	Benet-MIFA	M
12.	Chebet Andrew	Benet-MIFA	M
13.	Chemusto Carol	Benet-MIFA	F
14.	Shiondo George	WASWAPA	M
15.	Vincent Kutosi	WASWAPA	M
16.	Welishe Stephen	WASWAPA	M
17.	Wazabegwa Dison	WASWAPA	M
18.	Waniaye Yefusa	WASWAPA	M
19.	Watangwa Wilson	WASWAPA	M
20.	Shabire Stephen	WASWAPA	M
21.	Nagudi Janet	WASWAPA	F
22.	Namugongo Alex	WASWAPA	M
23.	Muzamiru Kuranica	WASWAPA	F
24.	Natiko Stephen	WASWAPA	M
25.	Khainza Mary	WASWAPA	F
26.	Mafabi Stephen	WASWAPA	M
27.	Madina Namudenyi	WASWAPA	F
28.	Cherukut Martine	KACOFA	F
29.	Chelangat Davis	KACOFA	M
30.	Musani Wilfred	KACOFA	M
31.	Sande James	KACOFA	M
32.	Chelimo Christine	KACOFA	F
33.	Sukuku Beatrice	KACOFA	F
34.	Chemutai Beatrice	KACOFA	F
35.	Chemutai Susan	KACOFA	F
36.	Chepkurui Francis	KACOFA	M
37.	Chemusto David	KACOFA	M
38.	Muneria Joseph	KACOFA	M
39.	Chepkurui Jackson	KACOFA	M
40.	Twala Satya Edward	KACOFA	M
41.	Banan Joyce	KACOFA	F
42.	Korir Sam Koja	KACOFA	M
43.	Chepkurui Joseph	KACOFA	M
44.	Suku Peter	KACOFA	M
45.	Chemayek Annet	KACOFA	F
46.	Chelimo Kokop	KACOFA	F
47.	Chekwoti Nancy	KACOFA	F
48.	Chekube Joan	KACOFA	F
49.	Cherop Davis	KACOFA	M
50.	Muneria Joseph	KACOFA	M
51.	Chemusto David	KACOFA	M

52.	Chepkurui Jackson	KACOFA	M
53.	Aliwa Justine	KACOFA	F
54.	Sukuku Beatrice	KACOFA	F
55.	Wetuga Mary	WASWAPA	F
56.	Mujjewa Martin	WASWAPA	
57.	Sulaina Makhonje	WASWAPA	F
58.	Florence Khabatsa	WASWAPA	F
59.	Muzaki Janice	WASWAPA	F
60.	Khainza Lorna M	WASWAPA	F
61.	Mutonyi Janice	WASWAPA	F
62.	Nandudu Juliet	WASWAPA	F
63.	Nambozo Phylis	WASWAPA	F
64.	Nambozo Mary	WASWAPA	F
65.	Shakilo Gorret	WASWAPA	F
66.	Namutosi Sarah	WASWAPA	F
67.	Waniaye Allen	WASWAPA	F
68.	Mutenyo Jalia	WASWAPA	F
69.	Shiondo George	WASWAPA	M
70.	Vincent Kutosi	WASWAPA	M
71.	Welishe Stephen	WASWAPA	M
72.	Wazabegwa Dison	WASWAPA	M
73.	Muledi Moses	WASWAPA	M
74.	Waniaye Yefusa	WASWAPA	M
75.	Nabuloli Loyi	WASWAPA	F
76.	Wamimbi Margret	WASWAPA	F
77.	Khabatsa Rogers	WASWAPA	M
78.	Watangwa Wilson	WASWAPA	M
79.	Shabire Stephen	WASWAPA	M
80.	Nagudi Janet	WASWAPA	F
81.	Namugongo Alex	WASWAPA	M
82.	Muzamiru Kuranica	WASWAPA	F
83.	Natiko Stephen	WASWAPA	M
84.	Khainza Mary	WASWAPA	F
85.	Mafabi Stephen	WASWAPA	M
86.	Madina Namudenyi	WASWAPA	F
87.	Kiptala Moses	Benet-MIFA	M
88.	Cheptai Alex	Benet-MIFA	M
89.	Chemutai Juliet	Benet-MIFA	F
90.	Lawendi Stephen	Benet-MIFA	M
91.	Chele Alex	Benet-MIFA	M
92.	Chelangat Philis	Benet-MIFA	F
93.	Cheptoris Betty	Benet-MIFA	F
94.	Cherop Immaculate	Benet-MIFA	F
95.	Chepkurui Fred	Benet-MIFA	M
96.	Bosei Micheal	Benet-MIFA	M
97.	Chelangat Fred	Benet-MIFA	M
98.	Chebet Andrew	Benet-MIFA	M
99.	Chemusto Carol	Benet-MIFA	F