Breaking Postharvest Bottlenecks: Long-Term Sweetpotato Storage in Adverse Climates

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Traditional heap storage in northern Ghana extends shelf life for up to 2 months with declining quality (credit T. Carey)

What is the problem?

With proper handling and cool storage conditions, sweetpotato can be stored for over a year. However, most places in sub-Saharan Africa (SSA), cold storage is not available, and sweetpotato has a short shelf-life following harvest. This can be due to rough handling during harvest, resulting in wounding, and rapid desiccation and rotting, or to weevil infestation, which occurs either before or after harvest, and also leads to rotting. Because of this short shelf-life, sweetpotatoes are usually sold very soon after harvest, typically at a time when prices are low because all the other farmers in an area are trying to sell as well. Farmers have an interest in storing to control the supply and help to maintain reasonable prices as well as to extend the season during which fresh sweetpotato is available for their own home consumption. Being able to store orange-fleshed sweetpotato (OFSP) for a significant period of time would ensure longer access to this rich dietary source of vitamin A to families in a region of the world where vitamin A deficiency is a serious public health concern.

There are traditional or indigenous methods of sweetpotato storage, though these provide rather inconsistent results. For example, sweetpotato can be stored in the ground in unharvest plots during the dry season until needed, but runs a high risk of becoming weevil infested. Storage in pits is also practiced, but is both labor intensive and quite risky as it is difficult to monitor quality, and the entire contents of a store can be lost before the farmer is aware there is a problem. Storage indoors in grass-covered heaps which are regularly sprinkled with water is practiced in the Upper East Region of Ghana, and can keep the crop fresh for at least two months. It is also labor-intensive due to the need for regular application of water and moreover, quality declines during storage due to prolific sprouting. Another common practice in dry regions is simply to process sweetpotato by slicing and drying to produce a storable product that can be used to feed the family during the so-called hungry season. However, such dried products with orange-fleshed varieties do not retain the desired beta-carotene content well under rustic conditions, and no more than two months in storage is recommended for OFSP dried chips. Properly stored fresh OFSP roots retain good levels of beta-carotene. Hence, developing appropriate techniques for long-term storage of fresh sweetpotato that farmers are willing to adopt would be very beneficial.

What do we want to achieve?

The impetus for this 18 month USAID-funded project came from a successful effort to improve storage of *Solanum* potato in Afghanistan using an improved ventilation system. We set out to determine if this same approach could be applied to sweetpotato in SSA. We also recognized that given the higher ambient temperatures in our target environments, success of our effort was far from guaranteed, so we included another approach in our investigation, that of applying the "Triple-S" method of storing small sweetpotato storage roots in dry sand, and later planting the roots to produce sprouts for planting. This method takes advantage of the sweetpotatoes natural ability to store in dry soil in tropical environments, waiting to sprout when the rains come. We reasoned that this approach could be applied to larger sweetpotato storage roots for

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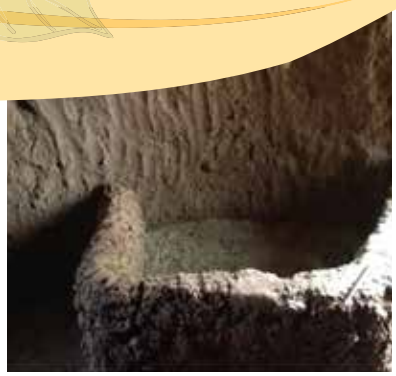
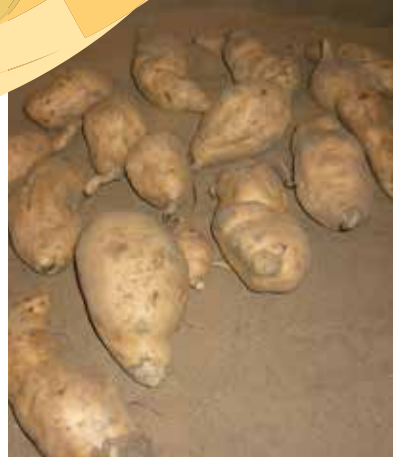
Traditional maize granary adapted for sweetpotato root storage in Malawi (credit E. Abidin)



"Sand box" storage technique evaluated in Bawku (credit M.A. Ibrahim)



Undamaged sweetpotato roots inside granary (credit E. Abidin)

consumption, perhaps not at commercial level, but at least at a scale that would stock household larders with fresh sweetpotato for up to six months.

Where are we working?

We chose sites in contrasting environments where sweetpotato is important in Ghana and Malawi. Bawku, in the extreme northeast of the Upper East Region of northern Ghana has a long, hot dry season, though temperatures can be lower in late December and early January during the so-called harmattan season when dry winds blow from the Sahara desert. Sweetpotato is a major cash crop in a number of communities around Bawku, and if they can afford to wait till prices rise, many farmers use the heaping and watering method already described to store their crop for up to two months till prices start to rise after the New Year.

In Malawi, we chose three communities in Kasungu and Mzimba Districts in northern Malawi where sweetpotato is important both in local markets and for home consumption. Sites in Malawi are much cooler than those in Ghana, largely because of the higher elevation, and temperatures can drop low enough to even produce frost occasionally during the coolest months. Pit storage is known in this area, though not widely practiced in modern times. In both Ghana and Malawi, OFSP was known, but producers were not aware of its nutritional benefits.

How are we making it happen?

In both Ghana and Malawi, CIP is partnering with Catholic Relief Services, and with local Catholic Diocesan and government extension partners. In Ghana, we are also working with the University for Development Studies (UDS), with a UDS graduate student conducting his thesis research on the project. At each location, project partners engaged with sweetpotato producers to discuss their interest in storage and to propose methods for investigation, including improved ("ventilated") pit storage, and storage in dry sand. Producers participated in the design of experiments, construction of storage structures, and the production of sweetpotato for trials in order to assure uniformity of varieties and allow comparisons among storage methods within a country. All partners also agreed on methods to assess stored sweetpotato quality, including taste tests, and agreed to timetables for conducting experiments and for participating in training about sweetpotato production, handling and utilization.

What have we achieved so far?

When this project began in Ghana the harvest season was underway, which did not allow us to carefully design trials there in our first season. However, it did allow us to do a preliminary study the first season, followed by a carefully planned study during a second season. In Malawi, we had time to plan and conduct one season of trials. During the first season in Ghana, a "sand box" storage method was designed and compared to traditional heap storage in 87 households in four villages. Sweetpotatoes stored using the sand box for 2 months retained freshness and eating quality very well compared to the heap storage method. Additionally, weevil damage in sand storage was greatly reduced compared to the heap storage since weevils cannot burrow through sand to get from one root to another. The ventilated pit method was evaluated, but not adequately, due to technical problems with the ventilation system. A second season of trials has been planned in Ghana and will allow the community-based comparison of 3 varieties (including introduced OFSP and local checks) in sand box storage with heap storage. The ventilated pit method will also be reassessed.

In Malawi, replicated community-based trials are underway comparing local and OFSP varieties of sweetpotato in 3 types of storage: ventilated pits, pit storage in sand, and storage in sand in traditional granaries (type used now for maize). Preliminary results from these trials indicate that the granary storage was superior to the other storage methods, resulting in reduced rots and termite infestation. Taste and market quality assessments also indicate the superiority of granary storage over pit storage. These results are still preliminary, but we expect to be able to store sweetpotato for up to six months in Malawi using the granary storage method, which would represent a significant improvement over currently available methods.

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