

# Pack 106, Item 3

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**Farmers adopt eco-friendly, zero-energy storage technique for vegetables in northern Ghana**

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**Notes to broadcaster**

Small-scale African farmers produce as much as 80% of their countries’ food supplies. In Ghana, the agricultural sector accounts for approximately one-third of the country’s Gross Domestic Product and provides the most jobs in the country.

But in many remote, rural areas of Ghana, frequent power outages and lack of access to electricity can make post-harvest storage of vegetables and other produce incredibly challenging, especially given the country’s tropical climate. This means leftover produce is spoiled before it can be sold at the next market day, contributing to food waste and food insecurity, as well as loss of income.

This is why post-harvest storage technologies that do not rely on electricity are some of the most reliable and sustainable ways to improve the shelf life of vegetables and other produce in Ghana—and why they contribute to food security and better incomes.

This script examines the Zero Energy Cooling Chamber (ZECC), an ideal technology for small-scale farmers and remote rural communities.

You might want to present this script as part of your regular farming program, using voice actors to represent the characters called Host 1, Host 2, Farmer 1, and Farmer 2. If you wish to adapt the script to better suit your location and community, please use interviews with farmers and experts from your own community.

You could also use this script as research material or as inspiration for creating your own programming on post-harvest technologies and zero-energy solutions to storing produce in your own region or country.

How? By talking to experts who specialize in post-harvest technology, or to farmers who use eco-friendly technologies, perhaps even Zero Energy Cooling Chambers. You might ask them:

* What are the major post-harvest storage challenges in your area?
* What solutions have vegetable farmers and other experts found for these challenges?
* What are your experiences with zero-energy technologies?
* Have you used, adapted, or changed the ZECC in any way, perhaps by using custom-made bricks or local materials?

Estimated running time: 25 minutes, with intro and outro music.

Besides speaking directly to farmers and other experts and key players in your farming community or area, you could use these questions as the basis for a phone-in or text-in program.

Estimated running time is 20-25 minutes, including intro and outro.

**Host 1:** Hello, listeners. On today’s program, we will be discussing a very simple and eco-friendly post-harvest technology that farmers here in northern Ghana have been using to store their fresh produce. It is a technology originally developed in India and transferred to Ghana by the World Vegetable Center. Working with food and post-harvest engineer Linda Dari from the University for Development Studies, the Center has been teaching farmers and building demonstration sites for the technology across the Northern and Upper East Regions of the country.

In this program, we learn about the technology, and about how two women in rural Bunglung in the Savelugu district, near Tamale, have become leaders in their community after learning how to build it and use it.

**Host 2:** Hello from me too. So what is this post-harvest storage technology? (PAUSE) It is called the Zero Energy Cooling Chamber, or ZECC for short. It increases the shelf life *and* the quality of vegetables by keeping them in a cool environment inside the chamber. The chamber is a simple brick and sand structure that is easy to build and maintain.

**Host 1:** The community of Bunglung in Savelugu just recently constructed a cooling chamber all by itself! Twenty people use this new chamber, with only two of those being women: Rahinati Alhassan and Nafisa Alhassan, both 40 years old. The two ladies have been setting an example in their community.

**Host 2:** Indeed, since starting to use the cooling chamber, Rahinati and Nafisa have expanded their farms and sold more vegetables at the market. They have also been spreading their knowledge by teaching other women in their community about the cooling chamber. But before we talk about the how-to’s of the cooling chamber, let’s hear about it in the farmers’ own words.

**SFX:** FARM AND COMMUNITY SOUNDS FOR A FEW SECONDS, THEN FADE UNDER SPEAKERS.

**Farmer 1:** We are in the rural community of Bunglung. About 20 of us here use the cooling chamber to store fruit, vegetables, and grains, but only the two of us are women. We make up for that by passing on our knowledge to other women in the community.

**Farmer 2:** The women come to us, and this is what we tell them: Before learning about this technology, we didn’t know you could store tomatoes for as long as two weeks. When we went to the market to sell our tomatoes, we would bring back whatever we couldn’t sell, and it would spoil in the next few days. So we had to throw it away.

**Farmer 1:** But now we store the unsold produce in the cool chamber and are able to sell it the next market day, and it still looks new. Incredible, isn’t it? The market is once per week, and we can take the same tomato to the market a week later.

**Farmer 2:** We were reluctant at first to go into vegetable farming because we didn’t have a place to store the produce. But since learning about the cooling chamber, we have expanded our farms. Before, I only used half an acre of farmland, and I didn’t sell any produce at the market. I used it only to feed my own family and myself, or to sell within the community. But now I farm two acres of my land: one acre for cowpea and one acre for a mix of vegetables.

**Farmer 1:** The same for me. Now that I can store fresh produce, I have expanded my farming because I can sell it at the market and make money. It has caused me to be independent. Now, when my kids come home from school and ask for money for their education, I do not have to talk to anybody else. I am able to give them money to go to school.

**SFX:** SOUND OF CHILDREN CHATTERING AND LAUGHING IN THE BACKGROUND. SLOWLY FADING.

**Farmer 2:** We learned in a training how to build and use a Zero Energy Cooling Chamber to store vegetables. When we got back from the training, the women asked us what we had learned. And we had the knowledge and the courage to pass on the information.

**Farmer 1:** Indeed, we even brought the women to see with their own eyes what the chamber looks like and how exactly to store the vegetables. Other women were asking us how they could join the group of people who are using the community’s cooling chamber. We will talk to them and show them how to build one. That’s how we pass along the information, by word of mouth.

**Farmer 2:** We told the other women they could use the cooling chamber to store their tomatoes and other vegetables. And just like that, they have been indeed using the chamber to store their produce.

**Farmer 1:** Looking ahead to the future, the plan is to build a second chamber—or even more. Cooling chambers can be built privately for a household, or be built in the centre of the community—like the first one—for everyone to use. We are excited to build more and continue taking advantage of this post-harvest technology.

**SFX:** SOUND OF COMMUNITY AND PEOPLE CHATTERING. THEN SLOWLY FADE UNDER HOST.

**Host 1:** Hello, listeners, you are back with your hosts. If you are just tuning in, we are discussing a post-harvest storage technology from the World Vegetable Center called the Zero Energy Cooling Chamber, which is being used in northern Ghana.

 As you heard for yourself, these cooling chambers have many direct benefits for those who use them. The chambers are easy and cheap to build. They are environmentally friendly because they don’t require any electricity. And they prolong the shelf life of vegetables and other fresh produce. This allows farmers to increase their planting, and spend more time on marketing. It can lead to more income and financial independence, for both men and women, both farmers and traders.

**Host 2:** So you are probably wondering: how exactly does a cold chamber that doesn’t use electricity increase the shelf life and quality of a vegetable? Let’s get into some of the technical details.

**Host 1:** It is important to note that, in Ghana, these cooling chambers work best in the northern region, where humidity is relatively low and the drop in temperature from day to night is greater than southern Ghana. Coastal regions have high humidity, and it is best to build these chambers in drier regions. It is also best to place the chamber in an area where the wind can reach it and help the cooling process.

**Host 2:** The basic idea is that keeping vegetables in a cool environment increases their shelf life and quality. That is exactly what these Zero Energy Cooling Chambers do. The chambers work on cooling principles that ensure that the temperature is colder inside the chamber than outside. The chamber itself is a simple brick and sand structure. It has a double brick wall, and the space between the two walls is filled with sand which is kept moistened when the chamber is in use.

**Host 1:** There is a little space, about as wide as four fingers together or 7-8 centimetres, between those two brick walls. You need to fill the small space between the two brick walls with sand. You will need to water this sand a few times a day to provide cooling moisture. Ideally, you should water it 2-3 times a day.

 That’s it: bricks, sand, and some water. Preferably fired clay bricks, but locally mixed mud-clay bricks will work too. If nothing else is available, simple mud bricks are alright as well. And a shed to prevent direct sunlight on the chamber.

**Host 2:** So the materials needed to build the cooling chamber are pretty simple and easy to obtain. The chamber itself can last for years, making it very cost-effective. The precise amount of materials needed depends on the size of the chamber, but we will give you two examples.

**Host 1:** In the Bunglung community, where the two women farmers live, a chamber was built by The World Vegetable Center using about 400 bricks. It’s a medium-sized chamber, and two very large crates of produce can fit inside it. The chamber is 170 centimetres long and 170 centimetres wide. It is 60 centimetres tall. To give you a better idea, 170 centimetres is about as long as the average person from head to toe. Sixty centimetres for the height of the chamber is about the distance from the ground to your knee.

**Host 2:** You could also build a larger cooling chamber that can fit about six crates of vegetables, or up to 120 kg of produce. You will need between 800-1000 bricks for this. This chamber will end up being 150 centimetres wide, 215 centimetres long, and also about 60 centimetres tall. But you can customize the size of the chamber based on how much room and material you have. Just make sure you have enough bricks!

**Host 1:** Before we get into the exact how-to’s, it is important to discuss how to prepare the site where the chamber will be built. Rahinati and Nafisa’s chamber was built under a shed to provide shade. But you don’t need to construct a shed if you build the chamber under a tree. Trees provide natural shade.

**Host 2:** You should also make sure the location is clean and far away from a dump to keep it safe from pests and diseases. Also, try to ensure the chamber is close to a water source for convenience. If that is not possible, water must be made available for the cooling chamber to run efficiently.

 You also have to make sure the ground is as flat as possible. Level the ground with a rake and clear away any clutter. Then add a layer of sand and rake it flat. This flat surface will be the foundation for the chamber, and will help with drainage.

**Host 1:** On top of this layer of sand, you will build a brick floor. This will be the floor of the chamber. The brick floor has to be two bricks wider and longer than the chamber itself. You will build the chamber on top of this foundation. To make the brick floor, mark out the dimensions of your cooling chamber, preferably with a measuring tape.

**Host 2:** Rahinati and Nafisa’s community did not have a measuring tape, so they placed two large empty crates on the floor, and bricks at the corners of the crates to show where the walls would start. This is a good method if you don’t have a measuring tape or a string.

**Host 1:** And now it is time to make the walls. Start by building the inner wall. Build the wall about four fingers, or about 7-8 centimetres, from the crates inside the chamber. Place the bricks on top of each other in an overlapping method, exactly the way you would build a wall or a house, but there’s no need for cement.

**Host 2:** When you have the inner wall, measure about four fingers or 7-8 centimetres. That is where you will build the outer wall. At the same time as you build the outer wall, make sure you fill the gap between the two walls with sand. The sand needs to be as high as the walls that surround it. It will be easier to keep adding the sand as you build the outer wall, rather than trying to fill the gap between the two finished walls later. Why? Because filling the gap as you go along will make sure the sand between the two walls is evenly distributed. When you water the sand later, it will be the same depth everywhere between the walls.

**Host 1:** To repeat: place two crates in the middle of the chamber. Build the inner wall about four fingers’ distance from the crates, and build the outer wall about four fingers’ distance from the inner wall.

**Host 2:** And make sure the crates are stacked with vegetables, so you know how high to build the two walls! As we said, it also helps to water down the sand between the two walls as you’re building them. This helps settle the sand. When completed, the inner wall can be one layer of bricks higher than the outer wall, but this is optional.

**Host 1:** Finally, the last step is to choose a convenient material to cover the chamber. You can use a jute or hessian cloth or plastic sheeting over the inner chamber, and cover the outer chamber with woven raffia mat to aid the cooling process. If the chamber is not under a tree, you will need to build a shed to provide it with shade.

**Host 2:** Remember: when using the cooling chamber, you should apply water to the sand at least twice a day, but ideally three times a day for effective cooling.

**Host 1:** There. That wasn’t too complicated. To summarize in six steps, the easiest way to make a Zero Energy Cooling Chamber in your backyard or community is: 1) Pick a naturally shady and clean location, away from refuse dumps and pests. 2) Add sand, flatten the surface, and set down a layer of bricks for the foundation. 3) Place two or three large vegetable-holding crates in the middle of this foundation. 4) Build the inner wall about the width of four fingers, or 7-8 centimetres, from the crates. 5) Build the outer wall about four finger lengths, or 7-8 centimetres, from the inner wall. Make sure you fill the gap between the two walls evenly with sand as you build. And finally, 6) Once you finish building the walls, cover the top of the chamber properly. Water the sand in between the walls three times a day.

**Host 2:** Now let’s hear about these how-to’s in the two farmers’ own words.

**SFX:** FARM AND COMMUNITY SOUNDS FOR A FEW SECONDS, THEN FADE UNDER SPEAKERS.

**Farmer 1:** In our community, the Zero Energy Cooling Chamber is right in the middle of the village. It is easily accessible, and one of the best parts is that there isn’t much upkeep. All we have to do is keep the chamber clean, and keep it well-sealed off to make sure animals don’t get inside.

**Farmer 2:** It is very convenient. You basically have a local refrigerator without having to use any energy or expensive material. For example, transporting fired clay bricks from the south would have been costly. So instead, our expert and engineer Linda Dari has been experimenting with custom-made bricks using a combination of clay and soil from anthills. Ours is a 50-50 mix of clay and anthill soil. So just experiment, adapt to whatever is locally available to you, and be creative.

**Farmer 1:** The first time I placed my hand inside the chamber, it was quite a surprising feeling. It was indeed cool, even though it was very hot outside. While the exact difference between the inside and outside temperature varies, the difference the chamber makes in post-harvest storage is very obvious.

**Farmer 2:** Take tomatoes, for example. When stored at room temperature, their shelf life is usually 7-9 days. The Zero Energy Cooling Chamber has nearly doubled that! That’s right. In the chamber, it’s closer to 12-15 days. Eggplant and cucumber, which usually only last two days at room temperature, can now stay fresh for four days. And those are just a few examples of many.

**Farmer 1:** We women often do more selling and trading than farming, but these chambers have helped us do both. We only do small-scale farming in our community—a couple of acres each—but that is actually ideal for these chambers. So it supports small-scale farmers like us.

**Farmer 2:** Indeed. We highly recommend it.

**SFX:** COMMUNITY AND CHATTER SOUNDS FOR A FEW SECONDS, THEN FADE UNDER SPEAKERS.

**Host 1:** Hello again, dear listeners. As we have heard, these cooling chambers are eco-friendly and easy to build.

**Host 2:** Indeed! They are essentially localized refrigerators, as expert and engineer Ms. Dari calls them. But let’s hear more about it in her own words.

**LINDA DARI:** Hello listeners. I’m a food and post-harvest engineer from the University for Development Studies, and I have built demonstration sites for Zero Energy Cooling Chambers in the Northern and Upper East Regions of Ghana, in collaboration with the World Vegetable Center. As your hosts mentioned, these chambers are essentially localized refrigerators that don’t use any energy!

**Host 2:** Hmm, so what exactly does that mean?

**LINDA DARI:** It means these chambers work as locally built refrigerators that don’t require any energy. It’s a cost-effective way of ensuring that a tomato can reach the market in top quality even a week after harvest, which leads to less leftover waste and better quality products. This improves livelihoods and food security for all those involved in the value chain, all the way from the farm, through the market, and to the buyer.

**Host 1:** This is great. I will consider building one in my back yard! (Both laugh)

**Host 2:** Me too!

**LINDA DARI:** Good idea.The research is still in progress and, as communities work with whatever materials are available locally, the technology is being improved. This is why I always recommend that communities use materials which are locally available to build the cooling chambers. It is about what works best for them.

**Host 1:** So this also means the technology is sustainable and easy to pass along to other rural communities?

**LINDA DARI:** Indeed. In fact, after we built these cooling chambers with farmers in their communities, many farmers now know how to do it all by themselves. This means the knowledge has trickled down and has been passed on, often by word of mouth between farmers.

**Host 2:** Excellent. (Pause) Ladies and gentlemen, that is all for today. Thank you for listening to our program about Zero Energy Cooling Chambers. We hope you found it informative and useful. Good luck with building your own!

**Host 1:** Thank you for your attention. Good bye.

## Acknowledgements

Contributed by: Anaïs Voski, journalism intern, Carleton University, Ottawa, Canada.

Reviewed by: Ing. Linda Dari, food and post-harvest engineer, University for Development Studies, consultant and partner for World Vegetable Center; and Ngoni Nenguwo, post-harvest specialist, World Vegetable Center.

**Sources of information**

Interviews:
Ing. Linda Dari, food and post-harvest engineer, University for Development Studies, consultant and partner for World Vegetable Center, Dec. 21, 2016.
Rahinati Alhassan, trader/farmer, Dec. 21, 2016

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Mohamud Sayilou, farmer, Dec. 21, 2016

Documents: World Vegetable Center / USAID: Postharvest Technology Brochure 2 – Constructing a Zero Energy Cooling Chamber

<http://avrdc.org/zeccs-keeping-cool/>

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