

# Pack 104, Item 9

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**Water-efficient gardens: Water is life.**

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**Notes to broadcaster**

It is undeniable that water is essential to life on Earth. Without water, nothing can survive. As rainfall decreases, desertification spreads.

Much of East Africa is facing uncertain times; the changing climate means that rainfall patterns are becoming more unpredictable. Rainy seasons are becoming shorter, and often more intense; heavy rains can damage houses and crops, and then several days can pass before the next rain shower passes through. Drought is becoming more common, and crops and animals are increasingly water-stressed.

Farmers need to plan ahead. Before rain falls, farmers should consider how best to use the water that falls on their land. When farmers have systems that efficiently collect and use rainfall, it can mean the difference between good harvests and food insecurity.

The following script is based on interviews with farmers and agricultural experts in Tanzania. The interviews were conducted with practitioners of water conservation around Arusha and Shinyanga. The script offers advice on how best to plan water-efficient gardens and farming systems.

You could use this script as inspiration to research and write a script on a similar topic in your area. Or you might choose to produce this script on your station, using voice actors to represent the speakers. If so, please make sure to tell your audience at the beginning of the program that the voices are those of actors, not the original people involved in the interviews.

If you choose to use this script as inspiration for creating your own program, you could talk to farmers who use water-efficient gardening in your area, and the experts who advise them. You might ask them:

Have rainfall patterns changed in recent years? If so, how?

Have changing rainfall patterns affected their farming practices?

Do farmers collect rainwater? What methods do they use?

How do farmers ensure that they use water efficiently?

How can farmers find the materials they need to collect water when it rains?

Estimated running time for the script: 20 minutes, with intro and outro music

Fade up signature tune and hold for 15 seconds to start the show. Signature tune fades out under host’s voice.

**HOST:** Hello, listeners! Welcome to (name of farmer program) on (name of radio station). This program is dedicated to one of the most important issues facing farmers today—how to use water more efficiently in their homes and to grow their crops.

Water is essential for life, let alone farming. Every life form on planet Earth depends on it. But rainfall patterns are changing as the climate reacts to global warming and natural events such as El Niño. Some parts of the world are getting too much rain too quickly, which leads to localized flooding.

But here in East Africa, many farmers are experiencing the opposite—increasingly poor and unpredictable rains. Most seriously, this is leading to desertification. Many farmers have considerable problems finding enough water to generate decent yields.

I visited two farmers who are using water-efficient gardening techniques, such as harvesting rainfall, preparing land, and irrigation, and we’ll be hearing from them later. But first, I would like to welcome into the studio (name of expert), an expert in water-efficient farming techniques.

Thanks for coming in today, (insert name here).

**EXPERT:** Thank you for inviting me.

**HOST:** Today, we are going to look at how farmers can best use their water resources. Perhaps you could outline some of the key factors for our listeners.

**EXPERT:** Of course. Water is farmers’ most precious resource. Many small-scale farmers occupy land which is marginal—that is to say lacking in fertility, with poor soil structure, or perhaps steeply-sloped. They rely on rainfall to grow their crops, and are exposed to the risks of droughts and floods. So farmers must come up with strategies to improve the way they manage their water supplies.

**HOST:** I understand the risk of drought, but why floods?

**EXPERT:** Well, the thing about heavy rain is that it can strip the topsoil away as it flows downhill. Farmers whose fields are moderately- to steeply-sloped should protect their soil against this erosion by building contours or bunds across their fields. These can be soil banks, sandbags, or stone walls. Building these structures will slow down the rainwater as it runs off the fields. This means that the soil will stay moist for longer, and, crucially, it will allow farmers to direct all the water that would have been wasted into areas where water is needed, or to be stored for later use.

**HOST:** So, when farmers are considering how to use water most efficiently, they need to think about the whole of their farm.

**EXPERT:** Yes, most definitely. There are some simple ways to collect water, but it is much more efficient if farmers focus on the bigger picture. By looking at the entire farm, thinking of the buildings and gardens as one system, farmers can use the water they receive from the skies much more wisely.

**HOST:** Ok, let’s start with the basics. What is the easiest technique to collect rainwater?

**EXPERT:** Well, the simplest place to start is in the home. Or, on it, in effect.

**HOST:** What do you mean?

**EXPERT:** Most farmers have protected their homes with corrugated metal roofs. When it rains, the water pours off the roof and onto the ground. By placing gutters under the eaves, farmers can collect all that rainwater in a waterproof holding tank. Ideally, this should be built with brick and concrete, with a tap and outlet pipe near the bottom of the tank.

You must remember to place some fine mesh at the point where water enters the tank: this will prevent leaves and other unwanted materials on your roof from entering the tank. The tank must also have a removable cover. This cover reduces the chances of contamination, prevents mosquitoes from breeding, and allows easy access when the farmer needs to clean the tank.

**HOST:** What can farmers use the stored water for?

**EXPERT:** The collected water can be used for washing, and for irrigating plants near the house. It can also be used for cooking, but farmers must remember to clean the tank properly before the rains start each season. They must also filter and boil the water before they drink or cook with it.

**HOST:** This means that farmers and their families can have water even when there is no water nearby.

**EXPERT:** Exactly. Having stored water beside their houses means that families can save all the time and effort they would have spent walking to and from the closest source of water. The more guttering that farmers can put up around their houses and other buildings, the more water they can collect when it rains.

**HOST:** Ok, so what other simple techniques can farmers use to manage water?

**EXPERT:** I mentioned earlier that farmers should build soil banks or bunds across sloping fields to slow water runoff. If they plan effectively, they can direct that runoff to a low point on their farm. There, they should dig a large pit to collect the water. They should line the pit with heavy clay or plastic to prevent the water from simply soaking away into the ground.

**HOST:** And what can farmers do with this water?

**EXPERT:** Well, they can simply store it until they need it to irrigate their gardens. Or they can use it to start an alternate enterprise.

**HOST:** What kind of enterprise?

**EXPERT:** Fish farming. Raising fish is an excellent way to make money because there is a great demand for fish, especially in drier, inland areas. If the pit is large enough, say four metres by five metres and one or two metres deep, the farmer can raise enough fish to make a good income. And here’s the hidden benefit: once the farmer catches and sells the fish, the water can still be used for irrigation.

**HOST:** It just needs to be pumped to where it’s needed. Ingenious!

**EXPERT:** That’s right. And there’s another bonus: When the water is removed, farmers need to clean the pit so it’s ready for the next rains. But the muck on the bottom of the pit will be full of fish waste and other organic matter, which makes an excellent fertilizer! Just dig it into your seedbeds before you plant and you’ll improve your soil. The soil structure will be better, the increase in organic matter means that your seedbeds will hold moisture for longer, and you’ll get better yields because the soil has more nutrients.

**HOST:** Talking about the gardens themselves, you’ve led us neatly to another aspect of water efficiency—how best to use water. Can you talk about some water-efficient farming techniques before we hear from the farmers I met earlier?

**EXPERT:** There are many ways for farmers to either reduce the amount of water they use, or, at least, to use it more effectively. For larger fields of, for example, maize or sorghum, try to disturb the soil as little as possible when preparing to plant seeds. The less the soil is dug over, the less the soil loses moisture. Farmers can actually plant their seeds directly into the soil.

How well this technique works depends a lot on the weed populations in the field. But if a farmer can wait until the crop is established before weeding, the crop will shade the soil from the sun and prevent it from drying out too much.

Another technique which is very common in semi-arid areas is direct water harvesting in sorghum and millet fields by digging tied ridges between plant rows or planting pits. The ridges or pits then collect and retain the rainwater for a much longer time.

**HOST:** Ok, but time is getting on: now we must hear how farmers put ideas like this into practice. Thank you for all that you have shared with us on this subject.

**EXPERT:** You’re welcome. I’m interested to hear what they are doing, too.

**HOST:** So, what are farmers actually doing in their vegetable gardens? Let’s listen to the interviews I conducted earlier with two farmers in their fields.

**SFX:** BIRDS TWEETING, SOUND OF SOMEONE IN THE GARDEN

**HOST:** I am standing in a lush garden near the village of Nambala, about 20 kilometres east of Arusha, in northern Tanzania. I am visiting Zadok Kitowari, who has a mixed farm with maize and green leafy vegetables, dairy cows, goats, and chickens. Mr. Kitowari, how do you use water efficiently?

**FARMER:** I used to rely solely on rainwater when it fell in the rainy season, but I found that my garden would dry terribly after the rains finished. I took a training offered by an NGO where I learnt that collecting water from my roof and storing it meant that I would have a more reliable source of water during the year.

**HOST:** So you installed gutters on your house?

**FARMER:** Yes. Actually, I also built a little shelter in my garden to store seeds and some of my harvest before I take it to market—and I put gutters on that too. It means I have a supply of water right in the garden where I need it most.

**HOST:** I see something interesting over there, between the house and the cowshed. It looks like a large gunny sack with cabbages growing from it.

**FARMER:** Well, that’s exactly what it is. I filled the sack with a mixture of soil and composted manure and placed it here, upright on this raised brick floor. I cut small holes in the bag and planted seeds in the openings. I only have to water the top of the bag, and the moisture seeps right through it. It’s a very efficient way of growing a crop in terms of space, and it uses very little water.

**HOST:** Wow! You have, what, ten of these, all with different crops. And here? Is this a raised seedbed?

**FARMER:** That’s right. I used the technique known as “double digging” on all of these seedbeds. I marked out these seven beds, about one metre by three metres each, and divided them into sections of about 50 centimetres in width down the length of the bed, so about six sections to a bed. Then I dug out the top 30 centimetres of soil from the first section and placed it to the side. Next I dug deeper, about another 40 centimetres, and placed the soil on the other side of the bed.

**HOST:** What did you do then?

**FARMER:** After that, I moved on to the next section. I dug out the topsoil from that section and incorporated it into the bottom of the previous section, then added some manure.

Then I removed the deeper soil from the second section and placed it on top of the manure in the first section. Basically, I moved the soil from section two to section one, and then repeated this in each section right down the bed. Finally, I added the topsoil that I had removed from the first section to the last section, and the bed was ready to plant.

**HOST:** It sounds like a lot of work.

**FARMER:** Yes, but the results are worth it. Double digging improves the soil structure and means the composted manure is at the right level for the roots. Double digging also raises the surface of the bed and makes it easier to reach when weeding or harvesting.

**HOST:** Can you explain why you surrounded the seedbed with old plastic bottles?

**FARMER:** As you can see, the raised beds are protected around the sides with plastic bottles. This keeps the beds neat and tidy, but there is another use—I fill the bottles with water. There are small holes in the bottom of the bottles which allow the water to drain out slowly. The roots of the crops then receive the water, and none of it is lost to evaporation. I also cover the soil with palm fronds, or grass cuttings, to act as mulch.

**HOST:** Why? What does mulch do?

**FARMER:** Mulch protects the soil from the direct heat of the sun, which reduces evaporation and means I can use less water. It also helps stop weeds from germinating, which reduces the competition in the seedbeds for water and nutrients.

**HOST:** Don’t you water the soil directly?

**FARMER:** I try to do that as little as possible. I do have some thin hoses which I can use to drip-irrigate the plants once they are established, but they are very expensive to buy. I try not to water the beds too much, because when it is very hot, evaporation can make the soil too salty, which affects its fertility, and can be toxic to plants.

**HOST:** I see that you have several animals. But they appear to be fenced in. Don’t you allow them to roam about?

**FARMER:** No. The cows and the goats cause too much damage, and it is cheaper to fence them in than fence the garden. It also means that I can collect their manure more efficiently. I have installed a biogas unit. This provides fuel for the kitchen and some lighting for my children to do their homework, and a good supply of composted manure for my garden.

I have only had the animals for the past few years, and I bought them specifically for the manure. As I said earlier, composted manure improves the structure of my soil and increases its water-holding capacity, which means I can use less water to grow my crops.

**HOST:** But your chickens are free to walk about in the garden, right?

**FARMER:** Actually, I find that they eat many of the insects that might otherwise damage the crops. They also leave their droppings directly in the gardens as they walk about.

I have been told that chicken droppings are an excellent source of potassium and phosphorus, which are essential nutrients for plants. So I protect the tiny seedlings from the chickens until they are well-established. I use chicken wire and palm fronds to keep the birds out of the beds. Once the plants are big enough, the chickens are less interested in them, and the benefits from letting them walk free outweigh the damage they might cause.

**HOST:** Ok, I have taken enough of your time, so I’ll leave you to your work. Goodbye, and good luck.

**FARMER:** Thank you. Come again any time.

**SFX:** MOTORBIKE ROARS OFF

**HOST:** My next stop was a few kilometres down the road, to meet with Apaikunda Anderson. She has a small piece of land near the village of Kikwe.

**SFX:** PERSON WALKING UPHILL THROUGH A FARM. SOUNDS OF CHICKENS AND OTHER BIRDS.

**HOST:** (PANTING FROM EXERTION) Good morning, madam. I see that your land is quite steeply-sloped.

**FARMER 2:** Yes, and there is no piped water here, so you can imagine what my days were like before I installed my water collection system.

**HOST:** How far is the closest source of water?

**FARMER 2:** There is a small stream about 20 minutes’ walk away, but to get drinking water I had to walk for nearly an hour to the closest communal tap.

**HOST:** Did you have to walk there every day?

**FARMER 2:** Yes, one of my children or I would go daily to get water. But I attached gutters to my roof, and to the roof of the shed here, and I built a large rainwater collection tank here next to my kitchen.

**HOST:** For the listeners’ benefit, could you describe the tank?

**FARMER 2:** Well, if they can imagine a large, flat-bottomed egg, about two metres tall and about one and a half metres across, they’ll have a pretty good idea what it looks like. It holds about 2,000 litres when it’s full, which is enough that I don’t have to fetch drinking water as frequently. I clean and disinfect the tank before the rains come, and the rains are usually enough to fill it.

**HOST:** That must save some time. Do you use it to water your crops?

**FARMER 2:** No, I prefer to keep this water for domestic use. Sometimes, we go to the streams to collect water for my herbs and vegetables if the gardens are very dry. But, as you noticed, my small farm slopes down into a natural hollow. Rainwater always filled the hollow to create a seasonal pond when it rained, so I could use that water to irrigate the garden.

I can still use the water that collects in the hollow but, about 20 years ago, I created a more permanent pond and started raising tilapia for sale. I dug the pond wider and deeper—you can see that it is about five metres square and about one and a half metres deep now.

When the rains fall, the water runs down the system of channels you can see, and fills up the pond. I introduce fingerlings every season. Once they grow to about 15 centimetres long, I sell them at the local market. Some people even come here to buy directly from me.

**HOST:** It must provide a useful income.

**FARMER 2:** Yes, I have been raising tilapia here for nearly two decades now, and they provide me with more money than I make from my crops. In fact, I even train other farmers how to raise fish.

I have only about half of one hectare here. As I harvest the fish, I can use the water in the pond on my garden if it needs it. But, more importantly, I get a ready supply of fertilizer for my garden when I clean out the pond every year. My soil is in much better condition than at any time before I started raising fish, and my yields are increasing every year.

**HOST:** Well, thank you for showing me around your farm. I am happy that you have a better water supply, and that you are making the most of your land—and water! Goodbye!

**FARMER 2:** You’re welcome. If you need to buy some fish, you know where to come now. Goodbye.

**SFX:** FADE UP NOISES OF COUNTRYSIDE AND FADE DOWN

**HOST:** Well, we’ve heard quite a lot about how to use water more efficiently in your homes, gardens, and farms. To sum up, try to collect water when it rains, to use in the home, to irrigate your plants, or even water your animals.

Prepare your seedbeds well with composted manure and other organic matter, because a healthy soil will need less water and stay moist for longer.

If your land allows it, create a pond in which you can raise fish. You’ll make extra money and have a tasty alternative for your cooking pot. A pond also provides a source of irrigation water if it gets too dry when the rains are not falling, and an annual supply of fertile organic fertilizer for your seedbeds.

That’s all for this edition of (insert program name here). Don’t forget to tune in next time—goodbye!

FADE UP THEME MUSIC FOR FIVE SECONDS AND FADE OUT.

## Acknowledgements

Contributed by: Paddy Roberts, B.Sc. Agriculture, Arusha, Tanzania.

Reviewed by: Salvatory Kundi, Agricultural Research Institute Ilonga, Kilosa, Morogoro, Tanzania

**Sources of information**

Interviews: Interviews with five farmers (three females and two males) were conducted in early November, 2015, in villages east of Arusha, Tanzania.

Telephone interviews were conducted in late November, 2015, with Mshamu Kaburu and Elenor Msola, who provided more information about water-efficient gardening in Shinyanga, Tanzania.

M. de Lange. 1997. Promotion of low-cost and water saving technologies for small-scale irrigation*.* In: Food and Agriculture Organization of the United Nations: *Irrigation Technology Transfer in Support of Food Security (Water Reports 1-14)* <http://www.fao.org/docrep/W7314E/w7314e00.htm#Contents>

Rockström, J. & Falkenmark, M., 2015. Agriculture: Increase water harvesting in Africa. *Nature,* 519 (7543): 281-283. <http://www.nature.com/news/agriculture-increase-water-harvesting-in-africa-1.17116>

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