

TARGET: Zero Hunger

Episode 6

The power of pollinators: why more bees means better food

[Buzz sound IN]

[Sandra] What do cucumbers, mustard, almonds and alfalfa have in common? On the surface very little. But there is one thing they do share: they all owe their existence to the service of bees.

[Buzz sound OUT]

[Theme music IN]

[Sandra] Hello and welcome to TARGET: Zero Hunger -- a podcast that explores the food challenges and solutions of our time, brought to you by the UN's Food and Agricultural Organization. I'm your host, Sandra Ferrari.

For centuries, this tiny striped helper has labored the world's fields without winning much recognition for its many contributions to food production.

Wild bees, in particular, seemed doomed to slog in the shadow of their more popular cousin – the honeybee – whose day job of producing golden nectar has been far more visible and celebrated.

But bees of all stripes are finally getting their moment in the sun.

[Theme music OUT]

[Sandra] That's thanks to a study that has been published recently a magazine called *Science*, which – for the first time - quantifies just how much our crop yields depend on the work of pollinators.

As these helpers move from flower to flower, they fertilize plants, and this may have a key role to play in improving the production of about 2 billion smallholder farmers worldwide.

By helping farmers produce better and more nutritious food, pollinators, in turn, help to ensure there's enough healthy food around for the world's growing population.

That's why researchers are tracking them closely...

[Fade in studio KJ interview with Barbara]

[KJ] Do you have a favorite bee? Or a favourite pollinator?

[Barbara] [Laughing] You know taxonomists, they name bees for people. So I got named for a bee. I mean, a bee has my name.

[KJ] You're kidding!

[Barbara] I'm very honoured about that. It's a very rare bee in the Namibia desert. But that's not my favourite because I've never met that bee...

[Fade out voice while Sandra voice comes in]

[Sandra] That's Barbara Gemmill-Herren. She spearheaded the FAO-led research into pollination that was published. She spoke to our producer Kim-Jenna Jurriaans about the research and why bees matter to food production.

[Barbara Gemmill-Herren Interview IN]

[Kim-Jenna] Hi Barbara. Thanks for taking the time to chat about pollination with us today.

[Barbara] Sure. I'm happy to do so.

[Kim-Jenna] So your area of expertise ecosystem services. Can you start us off by explaining what that term means and what role pollinators play in it?

[Barbara] It is one that we need to explain to people, because it's a little too technical. It just basically means "the benefits people obtain through nature", recognizing that there are these conditions and processes through which nature supports life. All agricultural production, forestry and fisheries – that provisioning of goods – comes from nature. That's a very fundamental service. But in addition to that, there are a lot of other processes - natural processes – that support production like climate regulation, water purification, and pollination. Pollination is a function that supports food and seed production and it's provided by nature. For millennia, bees and pollinating insects have been carrying out this service, being responsible for the production of ecosystems, but it's something people have not focused on, because it's just been happening in the background. Now that we start to look at it carefully, we know that the pollinators are important for, not for staple crops... not for things like rice and wheat or potatoes but for fruits, vegetables, seeds. Most of the plants that are richest in micro-nutrients are that ones that are dependent on the pollinators. In the end it becomes very fundamental to our food stuffs. Unfortunately, as we have gone on with agricultural development we have farm fields that have become larger, we use agricultural chemical, we do see that pollination services show declining trends around the world. Certainly in the US and Europe where we have an agricultural system that has large, large fields with little diversity, and through the use of agricultural chemicals we do see declining trends in a number of important pollinator taxa. We're really trying to figure out now how to re-engineer. How to go back and make an ecosystem that is more beneficial for pollinators.

[Kim-Jenna] I just wanted to follow up to one thing you just said. You said, the quality is better if the pollinators do the pollination. The quality of the food. Could you explain that?

[Barbara] Plants and bees have evolved for a long time. And a plant has to decide if they are going to put their resources well into a particular fruit. If it has been well pollinated – which means it has received a quite a large amount of pollen – a larger and more uniform fruit will develop. When you see a misshapen fruit, it's usually because bees only visited one side of the flower and not the other side. And so you get a little misshapen strawberry, which for the farmer is not even sellable. They'll just have to throw it out. Even if it's edible, people don't appreciate it in the market. And with apples you can see, small misshapen apples, have just not been visited by enough pollinators. So the plant will put more of its resources into the plant that is more pollinated. And that also means the nutritional quality is higher in that particular fruit. They've also done these blind tastings with tomatoes and found that, for people, they just taste better when more pollinators visit.

[Kim-Jenna] That's super fascinating. I had no idea actually. So often when we talk about pollinators we mean bees, but there are many other types of pollinators too right? Can you give us a quick overview of the different kinds of animals we're talking about? And the special jobs that some of them perform in fertilizing plants?

[Barbara] Sure. The pollinator that most people know about is the honey bee. But there is actually 25 000 different species of bees, and many of them are solitary bees that nest in the ground or next in trees. There are a few other interesting social bees, like these little tiny stingless bees in the tropics that make very small little hives and they make a teaspoon of honey in a day, but they have little colonies and no stinger, which makes them very attractive. So they're actually very important in the tropics. In more northern climates we have bumble bees, which most people know quite well. Very fuzzy, colorful bees. They are very, very effective pollinators and they fly very well under cold weather. So they do very well in Europe and in mountainous areas. They're very susceptible to pesticides however so there are one of the groups that's under the most trouble. Then in addition to bees there's moths, there's flies, wasps. Beetles are actually quite important pollinators. They're probably the oldest pollinator system. There are certain flowers that are completely oriented toward bringing the beetle into the flower, usually with a bit of fermented nectar, that gets the beetles a bit "drunk" and they stumble around into another flower. And that's actually a pollination system that is very effective and works on a few crops that depends on beetles for pollinators.

[Kim-Jenna] I want to delve a bit deeper into the threats facing pollinators. We've been hearing a lot in recent years about the threats of a declining bee population around the world. There's been talk of massive die offs; people are worried about the effects of pesticides; monoculture farming; the effects of climate change. What are the biggest threats to bees and pollinators right now?

[Barbara] So if we think about it, bees and pollinators need habitat. They need a place to nest and they need a place to eat. So they need good foraging resources. Places that are rich in flowers pollen and nectar. And they need to not have any environment around them that is too toxic. And we look at the farming systems we had a hundred years ago, they were actually very favorable for pollinators. And many of the farming systems in developing countries that are small and diverse, they're actually really good environments. It's one case where we don't necessarily need to say that everything we do hurts biodiversity. We've seen in Kenya, that actually, farmer's fields can have more diverse pollinators than in forests nearby because it's full of flowers. Usually a farmer's field has got a lot of sun and flowers. And if they are not using a lot of pesticides, the bees would prefer to go there then into the forests. And they may be actually very diverse then farmer's fields but as we've gone through a normal agricultural transition, to having farmer fields that have become much larger, become less diverse, and that use agricultural chemicals. This really impacts pollinators. And it does pose very good questions to us, like why is agriculture going in this direction and is there some other way that we can go about doing it to make an environment that is less detrimental to pollinators and to natural enemies, but also maybe has other benefits as well.

[Kim-Jenna] And what are the potential threats to pollinators on our food security?

[Barbara] So – pollinators, when we do not have them, will eliminate the yield of a certain plants, because they're completely dependent on pollinators. But then that's a subset of plants. So there's many plants which need the pollinators to have sufficient yield, but they won't completely disappear because they have a certain amount of self-pollination. So I don't think that pollinators are at the front line of food security and that if you lose pollinators you're going to diminish or eliminate large segments of our food supply. I don't think we benefit from putting it into this alarmist category, but it's important in the sense that pollinators are really important for those crops that provide good nutrition. And if we really continue along the same path with agricultural development becoming detrimental to pollinators. We will see big impacts on the food supply of those kinds of foods that provide good nutrition. I suppose you could make that up with more staple crops. You would go towards more rice, maize, maybe potatoes, but then we're losing out on you fruits nuts seeds and many of the vegetable crops. So I think it's more a threat to nutrition than it is to food security. And so not to take it lightly, but I don't think it's an immediate threat. It's not something we expect to have complete loss of pollinators, complete loss of crops within the next couple of years. It's a gradual process. Fortunately, we're at a point right now where we can turn it around if we decide to. You know, we do still have this diversity of pollinators. If we build the ecosystems, that are conducive to them, they will come in. They're very robust.

[Kim-Jenna] Now you were a part of a group of researchers that studied the effects of adequate and inadequate pollination on hundreds of farms in developing countries – in Asia, Latin America, in Africa. What did you learn?

[Barbara] So that was a very interesting study. We were very pleased with its outcome. Part of the Global Pollination Project had been to develop protocols to determine when a crop is suffering from a deficit of pollination. So in the end, we could do this in 11 countries, in 350 fields I think almost, with a real variety of crops. From blueberries to grapeseed and canola to mango, apples. The result that came out showed that for farms that are small farms, very diverse, that if they manage their pollination well. If they manage their pollinators well they can increase their crops yields – in median – 24 per cent. Which is really a lot. But it's very interesting to show, this is the first time anybody has really looked at what the impact is of pollination on crop yields. So to come up with a number that shows where pollination stands up against other farm inputs was really quite significant.

[Kim-Jenna] What kind of measures can farmers take to get more pollinators on their farm?

[Barbara] It really comes from just thinking out what pollinators need and being able to provide them. So one of the most important aspects is habitat on the farm – leaving some areas, perhaps under natural habitat, if that's not possible, creating hedgerows. We worked with some brilliant farmers in Ghana, where fields are very small, and it's just not possible for them to leave part of their productive land in hedge rows. But they planted all around their pepper field – cassava. And cassava is a root crop. So it doesn't need pollinators itself but it has a flower that is very attractive to pollinators. Pepper is not actually that attractive so by putting a ring of cassava around their peppers they would pull in the pollinators. And then the pollinators would go from the cassava to the pepper and pollinate their pepper. So this idea of thinking out what the pollinator need and making a habitat that is more conducive to them, is the most important thing. Leaving some nesting sites, some trees, if you have ground nesting bees – which is a lot of the squash and gourd and watermelon and so forth – the bees will often nest in the ground very close to the crop. So farmers need to look and see on the ground if there are these little holes. Just observe them and see where they are. And not to go with their hoe, or to drive over it or to walk over it. And so we've been trying to work a bit more on holistic farming systems that have benefits for all of these.

[Kim-Jenna] So what needs to happen at the policy level to harness pollination for better food security and nutrition around the world?

[Barbara] That's a very timely question, I think, as there has been this new body that has been set up. The intergovernmental platform of biodiversity and ecosystem services that undertook an assessment of pollination. It's their very first assessment. And they've just come out – that's a body that is made up of member governments. So the member governments all sat together and sort of negotiated this text on what needs to happen from a governmental standpoint. So that's a question that's out there and being considered and addressed by a number of governments. I won't go over all the details, but I think recognizing on a policy level the importance of pollination, having governments recognize this – something that has naturally occurred for a very long time, but because of the way we've been developing agriculture and managing ecosystems we're putting it under a threat;

and identifying what measures should be under taken. Just in summary I would say that the report comes out, embracing a different kind of agriculture, more government support for a more diverse agriculture – an agriculture that depends less on toxic chemicals.

[Sandra] That was Target: Zero Hunger producer, Kim-Jenna Jurriaans speaking with pollination expert Barbara Gemill-Herren.

One point Barbara highlighted was how bees are particularly important for producing some of the most nutritious foods we rely on. And how a lack of diversity within modern large-scale agriculture can be detrimental to natural processes like pollination.

That's why she and others in her field advocate for a closer look at the role of ecosystems in our food production – and to more actively include bees and pollination into our thinking and planning.

But what does that look like in the field? How are scientists and bee enthusiasts raising awareness among farmers about the importance of bees and their buddies?

[Stingless Bee Centre- Ghana Documentette IN]

[Bruce] So you are that they will not sting you...

[Peter] You can try it yourself. I won't talk. You can try it yourself.

[Bruce] Wow...Let's walk to one of the bee hives and have an experience with the stingless bees.

[Opening hive]

[Bruce] We are trying to open one of the bee hives...to see what actually we have...

[Hive open]

[Bruce] You can touch the bees. They are swarming our hands and they are not stinging.

[Peter] This is the honey. You can touch this.

[Bruce] Wow.

[Fade out scene]

[Sandra] Recently, our colleague Bruce Nyarko in Ghana took a trip to the Stingless Bee Centre in Cape Coast – to speak to another researcher who participated in the FAO-led pollination study. This researcher has been training local farmers how to get more pollinators to their farms and see bees as allies rather than their enemies.

[Peter] Good afternoon. You are most welcome to the International Stingless Bee Center.

[Sandra] That's Peter Kwabong, who founded the Stingless Bee Centre. He says, his Centre is the only large-scale bee research centre on the African continent and one of only three large bee research centres in the world.

[Peter] My special area is in bee ecology. I study all kinds of bees. In 2002 I travelled to Brazil and to my shock I realized there are other bees called stingless bees. They do not actually sting. They occur naturally. And climate or the vegetable of Brazil is similar to that of Ghana. So, when I came back I decided to do research with my students to see whether we have these bees in Ghana. And to my surprise, to date, I have 12 different stingless bees. And at the Centre here, I have four of them being commercialized and cultured. And research is ongoing with them

[Walking outside]

[Peter] The bees they don't sting. They don't sting, so they are not harmful. They can give you small bites here and there, and they can swarm in your face in large numbers. It's there way of defense. But as you ask me about my view. The fact that they don't sting is amazing. They don't sting. And they make honey. The honey the store in pots instead of combs. They make little pots and store their honey inside. So, anytime you can visit them and they are so friendly.

[Bruce] What are the best practices you are teaching the farmers over here, as far as bee farming is concerned?

[Peter] If you keep bees, it means that you are conserving bees for you pollination. We try to engage the farmers so that they can retain or attract more bees into their field. Bee pollinators, including stingless bees into their farm, their field so that any time they crop, they will get much more yield. One of them we call the cassava hedge row.

[Walking to the cassava farm]

[Bruce] So we are in the cassava farm now. Can you talk a bit about that?

[Peter] Yes. We have realized that in our local setting, the farmers use cassava as a hedge to demarcate one farmer's farm from another. And when this cassava is in flower, the bees and other pollinators feed off of this plant and other plants. And cassava stays on the farm longer than the other vegetable crops. So it means that, when their crop is not yet there, the cassava can attract and retain the bees feeding on their farm environment. We came to an agreement with the farmers that this is a good practice that should be promoted. And really the farmers didn't have any difficulty, because they saw that the bees were on the flowers of their plant whenever the crop was in flower. So it was something easy for them to

understand. So if you visit them now, and go to the vegetable producing areas areas where the Global Pollination Project carried out our research, everybody involved this technology. Every farmer knows that they have to plant cassava as a hedge row. At the end of the day, after they have harvested their vegetables, they can also have the cassava and they have a complete meal.

[Bruce] Exactly. So with the cassava practice, how does this fit into the local context?

[Peter] The normal local person would not feed bees. They just put hives thinking the bees will make honey. They don't even have a link between bee keeping and crop production. But through this project that we carried out this Global Pollination Project, we tell them "Look! you can incorporate this bee keeping with your farming!"

[Bruce] Very well so what are the main challenges you are confronted with?

[Peter] The main challenge is due to pesticide application. It is difficult to change farmers' perception about using pesticide – whether it's herbicide, or whether it is insecticide or whether it's fungicide. That is the main challenge. But the sites where we have trained farmers these problems have been overcome. But what we have now is how policy, government will take these findings and mainstream them into national agricultural policy.

[Stingless Bee Centre- Ghana Documentette OUT]

[Sandra] In addition to planting hedge rows, the farmers now also try to keep forests attached to their farms where the these bees can live and forage. And they now spray their insecticide late in the day after the pollinators are done with their job. And when they clear weeds from the field, they now leave the cut flowers lying on the land for the bees to enjoy before they rot and become natural fertilizer.

The Ghana study showed that little changes in farming practices can make a real difference in farmer's yields – and it's seeing this concrete benefit that eventually got the farmers on board with caring about pollinators.

And as Barbara mentioned, those benefits are quite substantial. Across all of the countries who participated in the study, farmers who invested in making bees comfy on their farms saw their yields increase by a median of 24 percent.

So that's nearly a quarter more yields. That's a lot of nutritious food.

[Theme music IN]

[Sandra] Bee populations are declining at the same time that we grow more and more plots of crops that depend on pollination, as we're trying to feed a growing population.

Mono-cropping, pesticides and higher temperatures associated with climate change all pose problems for bee populations and, by extension, the quality of food we grow.

Teaching farmers to value pollinators and apply methods to keep them buzzing around the farm year-round is increasingly important. But it's only one part of the larger job of changing attitudes and practices that value natural processes like pollination – not only in the fields but in the halls of government as well.

This episode has been produced by myself and Kim-Jenna Jurriaans.

If you have any questions or feedback for us please write to FAO-audio@fao.org.

I'm Sandra Ferrari, thanks for listening.

[Theme music OUT]

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