

TARGET: Zero Hunger
FAO Podcast transcript

Episode #3
“Can biotech benefit smallholder farmers?”

[Montage]

[Sandra] Hello and welcome to the third episode of Target: Zero Hunger -- a podcast that explores the food challenges and solutions of our time, brought to you by the UN’s Food and Agriculture organization. I’m your host, Sandra Ferrari. Today we’ll take a closer look at a set of tools that in many ways influence what the future of agriculture will look like. And that set of tools is biotechnology.

[Sound bed/Theme Music]

[Louise Fresco plenary clip]– Unqualified optimism as well as severe pessimism are incorrect in this case. The devil is in the details. It is probably the most important issue for the future of food and nutrition. We have to resolve it politically and technically.

[Gunter Pauli plenary clip] I think it’s very important that in this debate we enlarge the discussions. Ladies and gentlemen, bio depends on ecosystems. We need to understand the ecosystems as such and find the greatness of the ecosystem which gives us solutions we can never imagine in a laboratory.

[Gebisa Ejeta plenary clip] The debate has been mired with confusion and filled with irrelevance. It eventually got harsher, creating a huge chasm between the two global powers of science in Europe and North America. And what’s at stake, those in poor nations may have gotten too confused by the noise

[Sound bed/Theme music out]

The voices you just heard were of three keynote speakers at the recent International Symposium on Agricultural Biotechnologies held at FAO headquarters in Rome. We will be hearing more from all three of the speakers later in this episode.

Since the symposium’s focus was on the best ways to make these technologies responsive to the needs and concerns of small holder farmers worldwide, farmers with diverse positions on biotechnologies also shared their experiences.

Among them was Pomasi Ismaila a Ghanaian farmer and chairman of the Cocoa Abarabopa Association of Ghana in West Africa which represents 13,000 cocoa farmers. When he took over

his father's farm, he began to explore the best ways to modernize production and increase yields – not just for himself, but for a new generation of young farmers.

[Pomasi clip] Now, in this 21st century, of course nobody can say no to technology. And it's so important to farmers as well. We have had our traditional way of doing things and now we've been asked to accept a new technology. And as a young coco famer who has put in an investment the first thing I look at is, when I adopt this technology is it going to be profitable to me? [...] I look at various areas: the disease control, the amount of fertilizer I have to put in to increase the yield. When I balance this and then realize that it's good for me, of course I go for it. Why shouldn't we welcome it? [...] We have to welcome it. In fact it encourages young guys like myself, who think, look, it's not going to take me several years for me to recoup my investment.

[Sandra] But others are more cautious about the proliferation of biotechnologies.

[GUY clip] Seed selection from their own crops is the foundation of farmers' seed systems because those seeds are adapted to the fields and will adapt to climate change. These seeds were not selected thousands of miles away in laboratories with test tubes and a whole bunch of equipment that has nothing to do with what we grow in our fields."

[Sandra] That was Guy Kastler of La via Campesina – one of the biggest farmer's movement in the world.

We'll hear more views in a panel discussion later on in this episode. But first, we'll hear from Chikelu Mba, an expert on plant genetic resource use at FAO, and he talks about the reasons why FAO decided to host this symposium.

[Chike] We want to call attention to the fact that some of these biotechnologies actually are quite suited for the resource poor production systems of family farms in developing countries - where their production systems have become imperiled by the consequences of climate change.

[Sandra] But it's also about equality of access to these technologies and Bridging the north-south divide, as Chikelu puts it.

[Chike] I say this because a lot of the biotechnologies, especially the high tech but also the low tech, seem to be the exclusive preserve of the developed parts of the world. Whereas some biotechnologies - like artificial insemination or using tissue culture to produce disease-free planting materials - which the developed countries of the world might now consider mundane will actually be the game changer for many developing countries.

[Sandra] But he also mentioned how a lot of the countries still require support in building up the capacity of their local institutions to develop, regulate and oversee biotechnologies – support in training personnel, for example, and in keeping laboratories.

[Chike] For instance, there is the Cartagena Protocol on biosafety this is the agreed framework for the safe use of genetically modified all living modified organisms, but a number of countries

don't even have the capacity to detect the presence of genetically modified organisms in their food; they do not have the requisite laws; they don't have the policies. FAO and development partners continue to work with countries to make sure that such capacities become routine for every member country.

That was Chikelu Mba.

[Sandra] Chike mentioned that FAO traditionally uses a broad definition for biotechnology, from low-tech to high-tech – though the latter was not the focus of the symposium. The idea is that we need to look at all the tools we have at our disposal to fight hunger and malnutrition. Both agroecology *and* biotech. And FAO wants to be a neutral forum for an open and informed debate between all stakeholders about the safety and effectiveness of all these technologies -- to figure out *if* and *how* they should be applied to serve farmers and consumers.

To sum up three days of presentations at the symposium, our producer Kim-Jenna and I sat down for a coffee in the FAO cafeteria to compare notes and talk about some of the key issues that stood out for us.

[Cafeteria sound in background]

[Sandra] Ok, I'm looking at the speaker lineup again and we have over 50 -- a mix of University researchers, representatives of NGOs, civil society organizations, and the private sector...

[Kim-Jenna] Yeah, I'm looking at the list and I believe the final tally was about 400 participants from around the world. That also includes – let me check- 230 delegates from 75 governments and the EU.

[Sandra] So, what was the key issue that stood out for you from the sessions you attended?

[Kim-Jenna] So I guess I'll start out with some of the rationales why countries have been getting into biotechnologies in the first place. I feel like climate change, the need to increase productivity and nutrition where definitely mentioned a lot. We're looking at 800 million people on this planet who are still chronically undernourished. *2 billion* people are *malnourished* – meaning, that they don't get enough of the proteins, vitamins and micronutrients that they need. And on top of that, the population is growing – an even larger number of people that will need to be fed in the future.

[Kim-Jenna] *And* we need to do this at a time when our climate is changing and we're running out of valuable natural resources.

[Sandra] So, this connects to the presentation actually that I attended by David Spielman, from the International Food Policy Research Institute, in the US. He spoke on the social and economic impacts of Biotech. So basically, he mentioned that when you apply biotechnologies to three traits in crops alone – that is heat tolerance, drought tolerance, and nitrogen use efficiency – if you did that with even just maize, rice and wheat, we would be able to produce so much more food that the number of hungry people can be 40% lower by 2050.

[Kim-Jenna] So, I actually jotted down a quote from David’s talk about the need for strong impact assessment.

[Sandra] Oh good.

[Kim-Jenna] He says “the future of biotechnology in agriculture in developing countries depends on the rigor, relevance and credibility of our impact assessments and the quality of our discourse.”

[Sandra] Let’s talk about that for a second. *Because I feel like there was a lot of debate about the debate* itself – about the way we talk about biotechnologies.

[Kim-Jenna] A few speakers actually pointed out that biotechnology has in many ways become synonymous with GMOs and that has tainted the conversation about all types of biotechnologies. And FAO has gotten some critique, too, from certain groups for hosting the symposium in the first place—because they felt it was giving a platform to industry interest. So, there was that petition presented by 100 civil society groups led by La via Campesina for example...

That’s all to say, there was a wide range of views. But what I took away from the symposium most was just the variety of what we call biotechnology and what diverse practices fall under that umbrella to begin with. Many things we take for granted as part of day-today farming practices in developed countries but we don’t always think of as biotechnology.

[Sandra] Do you want to talk about some of the actual individual sessions?

[Kim-Jenna] Yeah. Let’s start with climate change, maybe?

[Sandra] Sure. By the way, I’m looking at the notes here and I think we both attended quite a lot of aquaculture sessions, so I think this might be a bit of a fish heavy conversation.

[Kim-Jenna] Yeah, but that’s ok right, it’s about the technologies. So you attended one on fish breeding under climate change. What did you learn?

[Sandra] So, I learned that fish are actually more vulnerable to temperature changes than livestock – and that’s because the body temperature of fish adapts to their surroundings. So there have been these massive summer time die offs of pacific oysters in Ireland, for example.

So aquaculture farmers are now looking for ways to breed more robust fish that are less affected by these changing temperatures.

[Kim-Jenna] And how exactly do they do that?

[Sandra] With selective breeding. So you identify the strong fish in your fish farm and you only breed on with those fish. And the biotech is you can use molecular analysis or DNA testing to look for characteristics that you want. **By the way, that was the presentation by Panya Sae-Lim from the Norwegian Institute of Food, Fishery and Aquaculture Research.**

And you also went to a fish and climate change presentation as well, right?

[Kim-Jenna] Yeah, I attended a presentation on fish vaccines. Quite interesting actually... So, you know that climate change will also affect bacteria, fungi, viruses and parasites – basically anything that produces disease in fish.

And Sandra Adam from the University of Stirling in the UK talked about how scientists are using biotech to create advanced disease tests and vaccines. And her goal specifically is to make these vaccines cheaper and reduce the need for antibiotics and chemicals in the fish industry.

That's also to address the issue of antimicrobial resistance that's become quite a hot button issue.

So In Norway, for example, the use of antibiotics was reduced by 99.5 percent, imagine, between the early 80s and early 2000s, just thanks to using fish vaccines instead.

[Sandra] Question, how exactly do you vaccinate fish?

[Kim-Jenna] It's mostly done by hand actually. One by one. With an injection.

So, you have to catch them, make sure they don't slip through your hands and vaccinate them. 408 million salmon worldwide. Isn't that crazy?

So, the problem is, for many diseases there are no vaccines yet and other vaccines don't work as effectively as they should, so that's one area of biotechnology where there's ongoing research and improvement.

[Sandra] Ok. Do you want to move on to nutrition? That was another key theme at the symposium.

[Kim-Jenna] Sure.

[Sandra] So, there was this great two-hour session on day 3 on the role of biotech in improving nutrition -- which Anna Lartey opened, she is the head of FAO's nutrition Division.

So, she looked at how our food environment has changed and how our diets are no longer supporting the nutrition that we want. Cereals have been getting cheaper, veggies are getting more expensive -- and the poor, in particular, increasingly rely on staple foods to fill their stomachs.

[Kim-Jenna] So, I actually went to that session too, I was in the back. Let me just grab my notes here. The presentation and that session I really liked was the one on fish meal – because we don't always talk about what our fish eat and how that affects our health. So, that was presentation was by Albert Tacon of Aquatic Farms. And he talked about how adding certain enzymes to fish feed can unlock certain nutrients in fish. And one of the biotechnologies they use is simple fermentation.

You take regular soybean meal, for example, and you just let it ferment for a week with good bacteria and you get better feed.

[Sandra] Let me segue to food quality here. **So Melissa Fitzgerald talked about** how a growing middle class in many developing countries is affecting the eating habits of people there – so the demand for quality food is rising with their economic power.

[Kim-Jenna] Ah yes, She a woman from the University of Queensland, right, in Australia who looked into the non-GMO technologies to make better rice and wheat.

[Sandra] Exactly. So people love Basmati rice, for example, because it smells great. But in fact it's a relatively low-yielding rice. So there are cross breeding projects going on now where scientists are taking other high-yielding rice varieties and trying to get a new type of rice that has both the famous basmati aroma but also yields more per planting.

[Kim-Jenna] But there was also talk about using cross breeding to get more nutrients into food, like increasing zinc and iodine, for example.

[Sandra] Ok, so last big topic. Let's talk about GM technology.

[Kim-Jenna] I went to a presentation on day 1 about the factors that determine whether biotechnologies can have positive impacts on the livelihoods of small farmers. Which was one of the key issues at the symposium. So, Narayan Hegde, from the BAIF Development Research Foundation spoke – and his organization works with thousands of farmers in India.

He said, on one hand, thanks to the GM cotton, yields have increased to such a degree that India has gone from being a net importer to being a net exporter of cotton -- and farmers are making more money accordingly. But he also mentioned that there is concern about the proprietary nature of the seeds and that more money needs to be invested in the public sector to avoid a total monopoly of private companies of these technologies basically. So, that was an example of where the symposium was taking the debate to the specifics of what's working and what isn't working for farmers.

[Sandra] Well, the reality is that farmers in many part of the world want access to these technologies... So with that in mind, I guess what's important is that the regulatory side also keeps up with these technologies like **genetic modification**, as Chike mentioned -- to ensure the countries that do want to use them do it safely and sustainably. By the way, if you missed it there was a whole session on **policies, intellectual property rights and regulation**. And it's online if you want to check it out.

[Sandra] Alright, are you done with your coffee?

[Kim-Jenna] Yes, I'm ready to go.

[Sandra] To go deeper into some of the main issues discussed at the symposium, we invited three of the keynote speakers into the studio and opened the floor for debate.

[Sandra - studio] In studio is Ms. Louise Fresco, President of the Executive Board of the Wageningen University and Research Center in the Netherlands; Mr. Gebisa Ejeta is a Distinguished Professor from Purdue University in the United States of America; and we also have Gunter Pauli, Founder of the Zero Emissions Research and Initiatives Network based in Japan.

So Louise, I will turn to you first. Biotechnologies encompass a wide range of products and practices. First off, could you give us an idea, with some examples, of what biotechnology is and what it isn't?

[Louise] Biotechnology is a kind of tool box and there is a lot of tools in there. It is not so that biotechnology only leads to genetic modification, it's actually a way for us to understand better the characteristics of inheritance of useful traits for example, stronger animals, and larger apples, and to work with these traits in a very specific manner to make sure that they are being inherited into the next generation.

[Sandra] We will come back to that in a second actually and I am glad you raised that point. But, first a question for all of you. What are the priority issues for you?

[Gunter] Priority is can we serve the needs that society have? I mean we have to respond to the basic needs of all in the first place. And to me it's not just a matter of is it biotechnology this or biotechnology that, it's what are the best means to reach those objectives. And if some biotechnologies are useful let's use them, but I am not saying I am in favor or against something. I am always looking for what's the best we know now.

[Sandra] Thank you Gunter, Louise.

[Louise] I think the priority in biotechnology is that we understand that there are lots of new techniques, that science is going very, very fast and that society as well as regulatory frameworks do not always follow. So we need a dialogue to get a better understanding of what biotechnology can do and cannot do, and how we should adapt and what it is that we actually want as society. Dialogue to me is the priority.

[Sandra] Gebisa.

[Gebisa] To me the priority is we've got 7 billion people at this time and the projection is that it's gonna go to about 9 billion. How can we feed 9 billion people sustainably with all the constraints that we have in front of us and then a huge, strong wind coming at us in climate change? To be able to feed humanity sustainably in some way is really the priority.

[Louise] I do agree that the top priority is feeding the 9 billion in a sustainable way. The question we should ask ourselves is: do we need biotechnology for that, and to what extent and where precisely? I think that's the most important thing that listeners should keep in mind. You cannot generalize about biotechnology, it's not either we do it or we don't do it but where, for what

products, what crops and what processes do we use to get to that sustainable food system of the future.

[Gebisa] And in that regard, what works in one particular environment and community is likely to be different in another. And not only the ecologies and the situations are different but also the knowledge level and the context of each one of those situations is different.

[Sandra] These debates have a tendency to be either very “pro-biotech”, that praises all technological innovation, or equally the “anti-biotech” position that warns against biotech in situations. Do you make a distinction between certain types of biotechnology as more-or-less beneficial for small scale farmers than other types?

Gunter, we’ll start with you.

[Gunter] I always have at a starting point the societal needs and what portfolio of technologies are available that allows to do it. And biotechnology doesn’t even have to be part of it, like in the case of paper. We see that it can be done by rocks and by recycling plastics. So, the debate is not should be before or against the eucalyptus that has been genetically modified. So use this debate. To me it is can we get paper to everyone now for which we use enormous tracks of land that probably could be used much better if we didn’t have to cut down all these trees just to make paper and use it a few times and throw it away.

[Sandra] In your keynote speech, Louise, you are casting our current generation of biotechnologies in the context of centuries, old traditions of farmers changing that genetic constitution of plants. So, how would you all respond to this? Can we acquaint today’s biotechnology with the cross-breeding our ancestors practiced?

[Louise] It’s both a continuity and a fundamentally different step. It’s continuity... because men have always been selecting individuals to get the best results, plants that didn’t get disease, animals that were strong enough and so on. That’s not new, what is new is that we now know far more precisely what we do, so we can focus on that. In the meantime, we have had a long period of having genetically modified organisms. They were seen as being a really different step. I think the current science actually shows that you don’t need to produce genetically modified organisms and yet benefit from the genetic understanding. [...] We are at a situation where we want to try and use the best of our science and the big fascinating thing is that science is actually moving in a direction that makes the new biotechnology much less different from what we had before.

[Gebisa] And, the African farmers’ situation could be significantly enhanced today without any additional change in the cultivars they grow. But at the same time, as soon as they begin to make resources available and their livelihood is beginning to change, opportunities arrive where they would be able to sell more. Then new genetic tools would come in to improve their varieties,

whether that is a conventional approach to select new varieties through conventional breeding or a more powerful tool that needs to come in. What defines that to me is the context, what the need is, in terms of what it is that we are trying to boost. At the same time, what is the constraint that needs to be solved. If it can be solved with a conventional technology that is available, so be it. And if it isn't, it is such intractable enough that you need to bring powerful biotechnologies. It would be a shame not to utilize that as well.

[Louisa] I think that I would agree that we need to do the agronomy and see biotechnologies as part of the farming system. But there is one area where I think farmers don't have a solution, that is in the increased pest and disease pressure for certain crops. Take cassava for example, 500 million people in Africa are dependent on cassava. Cassava suffers from a lot of diseases, you cannot easily propagate it so you cannot easily breed cassava. That's quite a difficult thing because it doesn't flower easily and we need to do something urgently about the diseases. We know the resistance to the diseases that cassava suffers from is not available in cassava nor in its wild progenitors. So we have to find it elsewhere, we cannot leave the situation. So, there are some cases where even the current situation and current farmer knowledge is not enough to solve the problem. And here we are talking about the poorest of the poor when it comes to cassava.

[Gunter] So let me interject here. I think, as a trained economist, an entrepreneur, I take a very straight forward look at it and say why do I need to go immediately to the biotechnology toolbox when there are other toolboxes available. So therefore, I am not saying we have to neglect it, we have to choose the best. [...] For blight control attacks they start spraying massively to protect. And of course then we need to use all the sulfites in our wines because you know having controlled the blights, we've controlled quite a few other microorganisms which now forces to put more sulfites in our wine to protect our wine. So, that is the wrong track, that is having unintended consequences over and over again which decreases the quality of wine on one hand and on the other hand increases the cost for the farmer.

And so the solution we have found for blight control is by studying the physical conditions under which blight thrives, and that is humidity level 61 %, PH drops. At that point blight attacks. So, I have to change the conditions and we do it simply by having dried threaded seaweed on the base. It's a tenth of the cost of the Zincoxite that has been sprayed, other world's products that have been sprayed, a tenth of the cost. It generates a good revenue for the coastal activities. You know France and many of the wine countries, they all have coastal zones. So my position is, I feel that we are too quick going to the box of the biotechnology and we do not use it enough with the call of the ecosystem. What other elements in the ecosystem could we add that really turned the blight around?

[Gebisa] I think very often we as professionals tend to be connected and be close to what we do and highlight on the particular intervention that we come up with. But I think context is what is important, and that is that in a situation, in one ecology, in one environment, in one country income situation... it may call for a particular kind of technology because the fluency is there

within the community, the economy allows it and therefore it's provided. It's provided not by charging them to go ahead and use it, but providing them as an option. So in any community if that's a possibility, for example, the suggestion that is given for controlling blights through the intervention that was just described now, by using algae, that option is available. Biotechnology solution would probably render that. Integrated pest management of some kind could be made available to the community. But what determines it is: What is and how serious is the problem, in terms of being sold with the conventional approach or new approaches that are being made available; and secondly the economic and social context of the situation is very important. So, I think sitting here for us, we cannot say one or the other because the circumstances are different around the world. And I think if we're talking about it in terms of context of developing countries, I think that becomes even more powerful, and then these developing countries are not one and the same.

[Louise] I agree the context is important but I am always impressed by the fact of how quickly farmers take up things when they see the benefits, and so we have to be careful not to suggest that biotechnology is something that only comes when the countries reach, when there is a different environment, and in fact if you look at what happens in, for example China, which is not a rich country in terms of biotechnology being adopted by farmers; or for example in India BT cotton - insect resistant cotton; or in Africa BT makes, this goes very rapidly because farmers are very eager to take up new technologies. But again it's not a matter of pushing those technologies, it's a matter of giving options to farmers and options to societies to choose whatever fits best in their cultural and economic environment. And in that sense I agree very much with Ejeta.

[Gebisa] No, I'm not saying also that the country needs to be at the second economic level, but when you have a society in many African countries - when technology has not penetrated into the communities, they have not seen the results of signs at all. The best way to introduce them is not likely to bring in a powerful biotechnology in an environment- and institutional environment in particular - that cannot support it.

[Sandra] And for a lot of these countries, especially in developing countries that are dealing with climate change and more pressure situations and then some other countries where they need to produce a lot more food a lot faster, a lot of these countries don't necessarily have the technology. And I'm curious to know, what is your position on the work that you do in the most kind of destitute countries, the ones that are in need of a very strong push of support?

[Gunter] We never look in our local, regional economic development, we never look at agriculture as an isolated sector. I mean food is related to health. Food is related to water. Food is related to economic industrial development... You know, you need to look at economy. So for me, the core question that we look at in destitute environments – take the Chocó in Columbia - where you know you have 85% of the people that are African descent. If you look at Chocó, and you look at the devastation that is caused by mercury based gold mining. Now we know that if you look at food security in this environment, it's going to be very complex because you're stuck

with a history and a present use of mercury that will contaminate the food chain horribly, so this is one of the reasons why we look at an environment and if you want to have the protein supplied it's not the toolbox of biotechnology, it is "gosh one of the only ways we can secure is to have a strong strategy for mushroom farming". Because the mushroom will allow us to secure the deconnection of the contamination of the gold mines that have been illegally going around. But then the second question you ask is how can we generate the highest number of drops because we believe that local economic development is – let's be honest - most of the biotechnologies don't generate jobs locally. You know, it is a food security issue and that's an interesting one, but for us it's local economic development and therefore we are very much hammering at the point of how much generation of jobs and how much of the value can be generated locally. Just a small example: We're looking at bread. In Chocó, in Mexico and in South Africa this is where we find the breakthrough in increasing nutrition content. I don't need to have a toolbox of biotechnology of the higher-end in order to get more healthy food to the people fast. It is the next harvest of mangos, those seeds 100 percent, were processing in the Chocó 70,000 pounds of seed of mangos, that goes into the food of just about everyone and I think we need to be more open in the debate on biotechnologies... to go beyond... either genetics or the genomes or the sequencing. That is one thing but there's so many other options that the biotechnology world is not at all looking at! Not considering! Because that is not big-budget and that is no big industry. It is of direct interest.

[Louise] But, let's correct something here. I think any serious agronomists or any serious Minister of agriculture would not focus only on biotechnology. I think that would be a major mistake. Certainly that's not the way we at Wargenengin look at things. We look at the total system and I fully agree with you using wastes - we think using waste is probably one of the best ways to retrieve nutrients from the food chain - and we use them again in the system so that's a logical option. And I think nobody debates that you should try all the possibilities that the ecosystem gives you and that they are far more than you think. But I object to the idea that we only push biotechnology because it would be for the big money. A lot of the biotechnology applications today are in fact in the public domain and their sponsored by publicly funded research, that's one thing. Thirdly, I'm interested in the toolbox insofar as it can solve problems that you cannot solve in another way. I mentioned already the cassava, the other thing – for example – is banana where we have major disease problems again and there are very little options there because again banana doesn't flour easily. We need to do something. Maybe the biotechnology toolbox is not the best one. But when it comes to helping poor countries, I want to explore with those countries what it is they need in terms of technical solutions based on sound ecology, obviously, but also in terms of capacity building, training people. We, for example, have been training in countries like Uganda all the staff of the food safety laboratory. It's not just biotechnologies, it's a lot of other things, because you need to have to capacity in those countries to know what is happening. Because if you don't have that, they are also at the mercy of indeed all kinds of companies that come in and bring in their stuff. We should respect the public nature of some of

the work; we should make sure that especially poor countries have the capacity to assess themselves, what is it they want to bring in. That to me is a real priority.

[Gebisa] Biotechnology is not necessarily devoid of generating employment and opportunities because I think it could easily be done. If I may use an example of technology currently in incubation in Kenya. That is a water efficient maize is being developed and that is [...], it's biotechnology. It's a combination of conventional breeding, as well as transgenic. And so, if a hybrid would be released over there, it could be adopted by a number of farmers. The delivery of that technology is going to require small enterprises being developed for seed production and seed delivery, seed distribution and as farmers invest on those hybrids they're likely to require fertilizers and fertilizer distribution is going to be needed, and so... an agro industry develops... And then on the output levels there are all kinds of opportunities in processing, and so on, that eventually were developed. So, any of these technologies – whether they are biotechnology - as long as they are able to solve a particular constraint that is limiting productivity and opportunity for poor people is going to be enhancing livelihoods because it contributes to employment as well.

[Sandra] This actually will ease into one of my questions. There are criticisms from farmers, small farmers, farmer organizations, and some of these concerns are about not being able to afford these technologies. How can this be addressed?

[Gebisa] It depends on what that technology is. You know, for example, everything wasn't like this in Europe and North America. Seed used to be the cheapest of all the inputs a farmer has, proportionately, because the value of the seed, proportionately, and what advantage the farmer has in enhancing production and the output that he has, and the opportunity that he has in profitability. But what had happened is, over time, as technologies got sophisticated and then licensing fees that are added on made seed very expensive. And in America, in North America and South America... that additional price did not limit farmers from using the technology because the market opportunity they have – more than compensates for additional price they paid for seed. And so that's why, in the context of that we need to be very realistic. What kind of technology is one that is going to be needed for a particular community And so in terms of delivering that, we don't have to rely on multinationals to distribute seed to small African countries that don't have the means to pay for this licenses. And therefore the investment in public institutions to encourage that so that an infrastructure and the delivery system could be put together is one option. Another option that is happening already in Africa, that's very encouraging, is small and medium enterprises are expanding in large numbers. There are lands for Green revolution for Africa created over the last seven years, it created about a hundred new seed companies that have been formed to deliver seed. So if the technology that is available is priced appropriately right, and the delivery system is created within the context of small-medium enterprises that can deliver the same way small and medium enterprises delivered this technologies for American farmers years ago, it can be done that way.

[Louise] I'm also not that worried about this issue of seed or the price of seed or the price of the improved breeds and for two reasons: one is that we have, in Africa, in the poorest countries or in India a long tradition of farmers already buying hybrid seeds. Hybrids are seeds that you cannot multiply yourself but they confers such an advantage that farmers have been willing and able to buy that seeds for at least 50 years in Africa. So the idea that seed is something that you buy is not a new idea. It becomes a problem of course, if the seed is poor quality. The second thing that we shouldn't forget is that, what we now call poor farmers are in fact often people who have very little opportunity...are... in a way they are people without a job living on the land. We are seeing a transition now because of the demographic shift of people to cities where there are fewer and fewer people in newer areas who need to feed the large populations of the cities. So small farmers in many ways will not and cannot remain small farmers because there needs to be a kind of new, professional, young group of young people who want to be farming. And you will want to farm in the best possible way with the best possible income for them as well. And that means, nearly always, that they need to have inputs. Inputs of seeds and fertilizers of equipment and what have you...

[Gunter] So, to me, I have a very different view. It's not a matter of having a few now new generations of farmers who are going to supply the world. That's not what it is. We need to do what we can to generate the jobs, the revenue and the value added on the existing small holder farmers. That's the challenge.

[Louise] But they will stop farming...

[Gunter] And, they will not. They will stop farming when you go biotech and when you go monoculture. Which is what we've been pushing on them for the whole time because we have an interest in increasing the output of one crop per acre. Can we generate more value using a portfolio of technologies, but the key messages is – let us get outside of the monoculture, large-scale, concentrated, source intensive kind of business, because that is part of world model that will never feed the world and will be high risk.

[Gebisa] The point that I really think is extremely right from my point of view, is that: what determines whether or not a farmer accepts the technology is not whether or not he's got a problem that needs to be solved. That pushes him to seek for a solution, but it has to be affordable and therefore that allows him to have opportunity for greater income to be able to turn back and afford that technology. The markets are important. The services are very important. In many of these instances, unless those are strengthened, just because we sit in our laboratories and create these magical technologies and say, "if you only use this your problems will be solved", it's not going to be happening. The reality is, in the environment where the farmer functions has to change. And those changes are if the farmer is being persuaded to accept the technology, at the end of the day is there market opportunity for him. The farmer is not foolish to jump at these opportunities just because at the experiment station he's seen a plot that looks very good, better than his. So, the realities around the context under the farmer's environment need to be improved to persuade the farmer to accept new technology.

[Louise] And I also think you're not doing justice, Gunter, to either the science or the policy or the farmers themselves by saying that we are pushing monoculture and biotechnology. I don't think any farmer would accept anything that's just being pushed onto them, but there are very few people... And certainly I think... I cannot think of an agronomist, a serious agronomist... who would just want to push monoculture. I mean, we all know [...].

[Gunter] It's a standard of the world....

[Louise] NO, it's not true. Come on.

[Gunter] How much of farming in the world is not done on monoculture?

[Louise] Well it depends on how you define monoculture. There are countries where it is very wise to use the land for a certain number of identical crops year after year because it's possible. But if you have potato, for example, in a country like the Netherlands it's absolutely forbidden by law to have more than one season potato because everybody knows that the diseases in the soil will build up. You switch and it depends on what you're switching to. Farmers in West Africa may very well be growing sorghum year after year. But that is their choice, it's not because somebody's pushing on monoculture.

[Gebisa] But I think it's also true that as modern science, modern technology comes to farm communities, the market situations has really promoted mono-cropping in many situations. That has been the legacy of Green revolution. But I think we need to be very smart and learn from the lessons of the past, and so the Asian Green revolution had brought about that kind of problem. As we begin to look at the Green revolution of Africa, we need to learn from the mistakes of the past and adjust accordingly and such that... as society gets sophisticated, as they do in Europe and the Netherlands I just described, these kinds of things to develop. And whereas in North America, in Asia by and large that as the market demanded a higher volume commodities that are really laid to a lot of mono-cropping. In the United States, how they managed it in terms of managing the soil is they built-up rotation from the beginning so that soy bean farmers and corn farmers rotate accordingly and contribute to the health of soil. So, society would have to be very smart on how they would adopt new technologies in their own context.

[Gunter] One of the problems we have is that we have too many MBAs. Masters of Business Administration – I have one of those diplomas. And the MBAs train to only look at one thing and focus and get economy of scale and get ever lower marginal costs. And unfortunately the farming community- particularly the larger operators in the farming community - have been pushing this very much because it's the logic of Harvard Business School and so on... So we have to realize we're in the world where focusing on one is promoted very heavily with a focus on generating ever lower cost prices. What we think is that the time has come to focus much more on generating value.

[Louisa] It is not true that a Green revolution has only led to monocultures of rice and wheat. If you look at these systems... if you have irrigated rice, obviously you cannot do potatoes on wet land.

[Gunter] No, but you can do spirulina farming on the same land....

[Louise] Yes, exactly... and so you do and so you have the vegetables and you have to fish and that's exactly the way the system should work. And you take the straw and you re-use it and use it for mushrooms or what have you... and I think in that sense we are indeed moving towards a much more ecological approach. But within that whole systems approach there still is from time to time, on selected issues, a real role for biotechnology, especially when it comes to quality enhancement and pest and disease resistance and that's how we should see biotechnology. In this wider context a wider context which allows farmers to be also innovators and to indeed add value to the system and gain a decent income.

[Gunter] So, my argumentation is: why do we narrowly define the biotechnologies as Louise has done it now? I think we need to enlarge the portfolio of technologies within the systems and get - you know - because it is not helpful to society to polarize between the good and the bad. That's not helpful, what is helpful is that we have a continued search for the absolute best and we have a search that goes beyond the genomes and the genetics, etc.

[Sandra] I'll put one final question to you all. Which is: what is the most effective way to move this conversation forward?

[Gunter] The only way to move it forward is to have concrete cases. To see things in the eyes. You know, we have 53 new goat farmers on the island of El Hierro in the Canary islands because we have now been able to generate so much value for the milk that they get 7 euros per litre. I mean they're kissing their goats to bed, because they're getting 7 euros per litre. That's where we need to go to. So, young people are moving from Barcelona, from Valencia, from Madrid. They're moving to these islands in the Canary region – which is far away from the centre of activity – because there's a livelihood that gives a quality of life on a farm. But who is paying 7 euros a litre? No one. But we succeeded in generating that. That is how we need to focus. Generate more value, generate livelihood. Make farmers the heroes of the world... because they are feeding us.

[Louise] Well, I agree that we should look at concrete cases. And to move it forward, I would think that we need to look at the best practices – including non biotechnology practices and see what works. And we need a place to exchange those practices. The whole problem with this debate is always that it's too general. It's about biotechnology in general, not about the real issue – the problem that needs to be solved – the types of farmers, the types of societies. So, I would like very much FAO to take a role there and become a platform where these kinds of cases can be exchanged and see what can we learn from the cases where things work, where they don't work, where other approaches work, and move the conversation forward from that.

[Gebisa] I think we've come to an agreement at the end. I think that we need to be very inclusive of all the options that are available, all the sciences both in production agriculture and agriculture that is sensitive to the ecosystem with greater attention. I think that's very important. But the one thing that we cannot deny is that today – around the world – to meet the growing world population that we talked about... we're not going to be able to do it without science and technology and innovation. And the unfortunate thing is that there is a significant segment of society that have really not gotten a good test of science, and particularly the continent where I come from. And in that context, Africa cannot afford to miss on opportunities that are coming from biotechnology. But that biotechnologies should not be delivered to Africa, whether it is by my University or by a company somewhere else... and then delivered to Africa in a way that it may not be sustained. And so I think what needs to be done is... the internal capacity of Africa needs to be done... where Africa's solution could be generated from within.

[Sandra] Biotechnologies are diverse. In this episode, we learned about some of these technologies and heard voices on different ends of the debate about if and how they should be used to make our agriculture more productive and sustainable for the future.

It's a debate that will continue to evolve together with the technologies.

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]

If you would like to listen to the full interviews and the full version of the in-studio panel discussion in this episode -- or if you would like to watch presentations from the Biotech Symposium -- visit our webpage at www.fao.org/news/podcast