HOUSE OF COMMONS

Science, Innovation and Technology Committee

Oral evidence: Innovation and global food security, HC 60

Tuesday 7 July 2026

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Watch the meeting

Members present: Dame Chi Onwurah (Chair); George Freeman; Kit Malthouse; Freddie van Mierlo; Samantha Niblett; Martin Wrigley; Daniel Zeichner.

Questions 252-359

Witnesses

I: Dr Riaz Bhunnoo, Associate Director, Thematic Research Challenges and Food, UKRI, Professor Anne Ferguson-Smith, Executive Chair of the Biotechnology and Biological Sciences Research Council (BBSRC), and Chris Danks, Head of Agri-Food, Innovate UK.

II: The Rt Hon Baroness Chapman of Darlington, Minister of State, (International Development and Africa), FCDO, Professor Sir John Edmunds, Chief Scientific Adviser and Director for Research and Evidence, FCDO, Professor Anjali Goswami, Chief Scientific Adviser, DEFRA, and Charlotte Baker, Director, Agri-Food Chain Directorate, DEFRA.

Written evidence from witnesses:

- UKRI
- FCDO and DEFRA

Examination of witnesses

Witnesses: Dr Riaz Bhunnoo, Professor Anne Ferguson-Smith and Chris Danks.

Chair: Welcome to today's session of the Science, Innovation and Technology Committee. A huge thank you to all our witnesses, and indeed to the members of the Committee, who have made it here despite the temperature in London and in this room. We will aim to keep the meeting on time, but if there are any concerns or anyone needs to take a break because the heat becomes too much, please let me know.

This is the Committee's fourth and final evidence session in our inquiry into innovation and global food security. We are hearing from officials from the UKRI, the FCDO and DEFRA. We are going to use this session to draw together the evidence received over the course of our inquiry into this highly topical and incredibly broad subject of innovation and global food security.

Q252 **Freddie van Mierlo:** I am going to ask the starter for 10 question, but please also use the opportunity to introduce yourself and describe what your organisation does. The UN has suggested that more than 600 million people will face extreme hunger by 2030, which is not that long away now. What role should the UK have in helping to reduce world hunger, and what role should its agri-tech sector have in tackling that food insecurity?

Dr Bhunnoo: Thank you very much for the invitation. I am Dr Riaz Bhunnoo. I am an associate director in the Biotechnology and Biological Sciences Research Council. I oversee our thematic research challenges, one of which is sustainable agriculture and food. I also co-ordinate research across UKRI on food systems.

Clearly, as you have articulated, we need to look at the global challenge. We have obesity, micronutrient deficiency, hunger, climate change and geopolitics, lots of things around resilience and biodiversity loss, and lots of sustainability challenges. So the future food system should ensure that all people—this is the FAO definition, actually—are able to access enough safe and nutritious food for an active and healthy life. The vision is a thriving agrifood sector that ensures food and nutrition security, supports economic growth, provides resilience to some of the threats I highlighted earlier, and is good for sustainability.

I guess the key role for us in the UK is using our world-class research and innovation and translating that into sustainable solutions, both here and abroad. Agri-tech can probably add value in three major ways. First, there is resilience to climate change and to pests and diseases, whether that is through precision breeding, early detection or operationalising controlled environments. Secondly, there is something around increasing sustainability, particularly through precision agriculture, such as by reducing inputs. Thirdly, there is increasing the productivity and nutritional content of the products we produce.

One other point I would make is that the adoption of both high and low-tech approaches by farmers both here and abroad is critical. There is a need to collaborate with farmers, and that includes both academic-led but crucially also farmer-led approaches, because that drives research into practice and leads to farmer-farmer knowledge exchange, which is really important in trying to solve some of these problems.

Q253 **Freddie van Mierlo:** Thank you; that is really helpful. Can I ask the same question of Professor Ferguson-Smith? You have been looking at this from a genetic perspective, is that right?

Professor Ferguson-Smith: I have little to add to what Riaz just outlined. He summarised well the priorities and what the UK research and development and innovation sector has to offer. We have a world-class research base in the UK, and we have invested extensively in national research infrastructure through our national capabilities—our institutes that sit on innovation campuses. We invest and lead in plant and animal genomic sciences. We do that collaboratively, both nationally and internationally. That provides opportunities for us to shape that global food security landscape, and to drive and lead on that.

Q254 **Freddie van Mierlo:** I shall resist asking follow-ups, which I will leave to colleagues, but I already have some ideas sparking off from what you just said. Finally, the same question to Chris Danks.

Chris Danks: I am Chris Danks; I am a part of UKRI and I work with Innovate UK. We are focused on the business-led side of innovation. My background was as a Government scientist then leading a spin-out, so I appreciate it from the SME perspective. Food production has always been innovative; we would not be eating now otherwise. The whole sector globally has always been innovative to produce food. We are in a new generation, where we want to take new technologies, new approaches and better understanding of old technologies, so that we can continue to do that. The UK will play a really important part in that, with the technologies that we are developing and the ability to implement those for future use. This has always been an innovative sector, and it needs to continue and go with a new generation.

Chair: Thanks for that introduction into the importance of the UK's agri-tech sector, and how we are leading in so many areas. I value setting that out at the start. The evidence we received as part of this inquiry did not contradict what you are saying, but it did say that the innovation funding landscape, which you are largely responsible for, can be complex and bureaucratic, making it difficult for agri-tech SMEs. Looking at the wide range of organisations, different grants, criteria and environmental circumstances, I can understand that. Mr Danks, what specifically is Innovate UK doing to address the fragmentation? If I were to run a small business—in, let's say, Newcastle—developing something wonderful to address global food insecurity, where would I go?

Chris Danks: From an Innovate perspective, there is always a level of bureaucracy, because it is taxpayers' money, which has to be protected and applied for correctly. I always go back to the fact that agrifood is a

part of this; we are funding things in agrifood, but Innovate funds all innovations. We clearly have some challenges within the processes that we do for agrifood companies, which do not hit other companies. We have seasonality issues, and we have to extend projects more regularly because of climate issues and things like that. We are rapidly trying to learn how we can process applications more effectively and get decisions to SMEs more quickly. That is important so that they can understand what is available and the timelines it is available in.

One comment I heard on a previous panel was about continuity of funding support. I have been involved since 2015, and we have had the benefit of having multiple programmes—although all different—funding the same thing. We have had the Agri-tech catalyst, "Transforming food production" and now the DEFRA farming innovation programme have been like a continual level of funding, although each one was subtly, slightly different, with different remits. That means that we have built the SME community extensively. The number I have heard is that it is 40 times what it was in 2015, so a lot more businesses are getting the grants and understanding the process of them.

We will then move the grant into new areas. When we did that with the ADOPT programme with DEFRA, we realised that we had to make it easier for farmers to apply. Farmers would not historically apply for an Innovate UK grant, although they may be part of collaborations. However, we needed farmers to go directly to ADOPT, so we made the form much easier to fill in, especially the costs that have to be indicated and put into the application. That is really key.

We try to ensure that the assessment of the applications is appropriate to the size of the award. We have had a policy in the agrifood part that all projects above £1 million are subject to an additional interview. That extends the process, but it ensures extra scrutiny so that it is not just about how good you are at writing the application. In many cases, we have had excellently written applications that have scored extremely well, and then when the consortium gets to the interview, they have failed under the challenges of the interview. With the farming innovation programme, we have a farmer on the interview panel. It is amazing how many projects looked fantastic on paper but did not take the challenges of the farmer pressing them.

Q255 **Chair:** Thank you for that. That is a great overview of the processes involved, but I am still not clear whether you are saying that you believe it is joined up. What are you doing specifically to make it easier for businesses and farmers to navigate the complex landscape?

Chris Danks: I would personally say that it is more joined up now. We have had the benefit of the DEFRA farming innovation programme, which is now into its sixth year and will run until 2031. It is the first programme I have seen that is longer than four years. That has made a real difference to getting an SME or a farmer through the whole process, from early research to later-stage feasibility and then scale-up.

Q256 **Chair:** Is there a front door that a small business from Newcastle can go to?

Chris Danks: A front door? Yes. In Innovate UK Business Connect, there is an agrifood team of 10 that works with them from a company perspective.

Q257 **Chair:** Innovate UK Business Connect?

Chris Danks: Yes—it used to be called the Knowledge Transfer Network. Its role is to work with the SMEs. It works more with farmers. And then we have lots of other farmer networks. We have the ADOPT hub, which is specifically focused on helping farmers—

Q258 **Chair:** So my Newcastle business should google "Innovate UK Business Connect", and then they would write to them—

Chris Danks: Definitely, yes. There is a team of 10, so if they are interested in a particular area, there is probably a specialist. If not, they can contact them—

Q259 **Chair:** There is a team of 10 for agri-tech?

Chris Danks: For agrifood.

Q260 **Chair:** If they are successful and they get to be larger, would they stay with the same team of support within Innovate UK, or would it be a different team?

Chris Danks: It stays with the same team. One of the things that we have been able to do with the newer programmes is that, once we have seen a company and it reaches the end of that project, we can actively identify the next route for them. It could be further grants or an investor partnership. It could lead into global opportunities or scale-up funding. This is the first time that we have had a programme that is long enough to be able to offer a full solution so that we can direct companies to the next place as they finish one project, assuming it was successful—not all projects are successful. The Business Connect team can be the central part, and then we can point people in other directions too.

Q261 **Chair:** How does Innovate UK support businesses across the funding cliff at the scale-up stage?

Chris Danks: Since about 2015, we have been working a lot on this. We have realised that the cliff generally requires them to get private investment. We have been doing agrifood investment showcases since about 2017, and we have built in a scheme called the investor partnership. We have run about five rounds, and the new rounds are currently going through the DEFRA programme. That is where we fund an SME project at the same time as they are raising private finance. We will fund, say, a £2 million project with a 45% grant—a £900,000 grant—on the basis that they must secure private investment of twice the level of grant.

Dr Bhunnoo: I want to add a couple of things in terms of your specific question about making it easier for companies to navigate our scheme. We

now have harmonised and simplified schemes for translation and commercialisation.

Q262 **Chair:** Are these all accessible through the Innovate UK Business Connect agrifood—

Dr Bhunnoo: Yes. There is now a funding finder page for all the UKRI schemes in advance of those schemes coming out. There is a lag time of three months. People are warned of what is coming and can then prepare and get on with things. There is a single port of call for schemes around innovation, and there are four schemes now that operate across UKRI—not individual council schemes, but four clear schemes across the pipeline.

Professor Ferguson-Smith: That is all enhanced by the new UKRI transformation structure that Ian Chapman has put in place. Within buckets 2 and 3, in that intersection, we have these new programme boards, where we have that end-to-end connectivity between cutting-edge research and innovation that is leading to start-ups. We are now connecting it much more efficiently and effectively with Innovate through these programme boards. Innovate and our deputy chairs of all the programme boards are working in a way that is unprecedented.

Q263 **Chair:** To my original question, what you are saying is that this is all accessible through Innovate UK Business Connect.

Chris Danks: Yes.

Q264 **Chair:** And is seamlessly supported through that.

Chris Danks: Yes. We realise that those competition pages and that sort of thing for the business community are the norm. For farmers, it's different. For farmers, a big focus has been—this was only last week—Groundswell, the big cereals event. You can engage with farmers directly and through networks like Agri-TechE. That farmer contact is usually the first way to get them involved, and then you can pass them on to the other parts later.

Q265 **Chair:** Thank you; that is very helpful. Before I hand over to George to look a bit more at private sector investment, I should say that I am a north-east MP, and I recently visited Newcastle University's rural innovation centre. There are differences between the climate, the soil and the opportunities in the north and the south and in Scotland and Wales. I don't know who the best person is to answer this, but what kind of place-based schemes do you offer?

Dr Bhunnoo: Our institutes have a clear role here. There are our BBSRC strategic supported institutes across the country: the John Innes Centre, Roslin and others, alongside world-leading universities.

Q266 **Chair:** Are they distributed across the country?

Dr Bhunnoo: They are distributed across the UK in different locations and they take place-based approaches. They locate businesses from the local area alongside the institute. They work very closely with local enterprise partnerships.

Q267 **Chair:** Which is the one in the north-east?

Professor Ferguson-Smith: The Roslin Institute is positioned in Edinburgh. The IBERS is positioned in Aberystwyth in Wales, and the Pirbright Institute is just outside the London area. The Norwich Research Park has three institutes, which I am sure you are aware of, and we have the Rothamsted Research institute—

Chair: In?

Professor Ferguson-Smith: In Hertfordshire. These institutes connect and collaborate with higher education institutions across the UK. So there is collaboration.

Q268 **Chair:** My geography may not be that wonderful, but I do know that that is not in the north-east, or the north-west for that matter. So the answer to my question about my business in Newcastle and representing regions across the country is that they do not have an institute that offers place-based support.

Professor Ferguson-Smith: What is really important, actually, is the outward-facing nature of these national capabilities. Of course they are supporting regional investment. For example, we have the Lincolnshire local innovation partnership, which is involved in developing robotics automation. It is well-renowned for soft fruit agriculture. We have a network around the country, and the key thing is that we connect these research and innovation—

Q269 **Chair:** Sorry to interrupt, but I think it is important not only to connect them but to support them in their place. Do you have figures for the proportion of grants or funding that goes to each region?

Professor Ferguson-Smith: Yes, we do.

Dr Bhunnoo: Can we come back to you on that?

Professor Ferguson-Smith: We do have that information, so we can provide you with it.

Q270 **Chair:** I press that because our recent inquiry into regional innovation and growth found a lack of data on how we are investing in place-based programmes and determining whether they are successful.

Professor Ferguson-Smith: We have that data, so we can share it.

Chair: Great, thanks.

Q271 **George Freeman:** Morning, all. I want to ask how you are using public research in the UK, such as UKRI and agri-tech, to unlock private research and global impact. You all said at the beginning that you agree this is global grand challenge—we have to feed 9 billion mouths. We have amazing science, but I think you would agree that, traditionally, in the last 40 or 50 years, we have not been very good at turning it into global impact. First, on the public funding, does any of you know—as a trade envoy, I would love to know—what the UK invests every year, through

UKRI and other programmes, in private agricultural science research and innovation?

Dr Bhunnoo: UKRI spends about £266 million a year; I suspect that the Government figure is higher. We used to have figures a few years back of the order of £400 million, so I would guess that it is around half a billion.

Q272 **George Freeman:** So £266 million is the UKRI number, and you think—but, very candidly, do not know—what the figure for the rest of Government is?

Dr Bhunnoo: I do not have that figure, because we have not calculated it recently.

George Freeman: It is perhaps double.

Dr Bhunnoo: Yes.

Q273 **George Freeman:** And would that extra money come through DEFRA?

Dr Bhunnoo: Yes, through DEFRA and other Government Departments.

Q274 **George Freeman:** Are you all happy to run with a number of roughly £400 million, half of which will be UKRI—BBSRC, Innovate and other projects—and half DEFRA?

Dr Bhunnoo: Perhaps two thirds UKRI, but yes.

Q275 **George Freeman:** Do you know which nations are top in global investment in agri-tech, and where we sit in that league table?

Dr Bhunnoo: I know that we are in the top five. From the data I have seen, we are ranked alongside the US, China, India and the Netherlands.

Q276 **George Freeman:** Can you give me the numbers? I do not think we are in the top five.

Dr Bhunnoo: I can provide that to the Committee later; there is a chart.

Q277 **George Freeman:** I have China at about $1 billion, up about 80% last year. The US is at over $5 billion a year, and the EU is now going up to $2 billion. India is at $1 billion, and Brazil is at $100 million. At £400 million, are we bigger than Brazil?

Dr Bhunnoo: Yes, although it is possible that my data is out of date.

Q278 **George Freeman:** Let us take that number. You will have seen that we have had some really good sessions in which we asked the Secretary of State, Minister Vallance and others what the mission is. Really, the mission is to convert our great science into world-class impact, through patents and prizes, as well as into growth, innovation and domestic and international security—food security is pretty important.

Do you see it as UKRI's role, in enhancing the role of the research councils, to deliver that? Do you take that number—£266 million within

UKRI and £200 million across Government—and ask, "What are we doing to turn that into private investment, growth and global impact?"?

Dr Bhunnoo: Our role in UKRI is to support end-to-end innovation, from curiosity-driven science right through to commercialisation, and to work with the funding we have and as many partners as we can to deliver it. We work very closely with Government—

Q279 **George Freeman:** I think that is a polite no. I think that says that that your role is to make sure that the system is working, not to try turning £266 million—or £400 million for the whole country—into £1 billion of private investment. You do not have a number for that.

Dr Bhunnoo: I am not sure we have a target, but perhaps Chris has something to add.

Chris Danks: We do not look at it from the perspective of an investment target, but we absolutely have the aim of ensuring that SMEs grow. The stark reality is that, without international private investment, they will not grow big enough to attract a global audience. That is absolutely a mission that we are trying to achieve.

Q280 **George Freeman:** Does any of you know the amount of private sector investment in agri-research and development technology in the UK and the SME funding number?

Chris Danks: The challenge is probably how you define it. When we did a list, it included about 30 or 40 companies that are UK-registered VCs or angel funds that have an agri-tech company in there. If you asked which are focused on agri-tech, it is probably two or three, tops, that are UK based. From an SME perspective, I think Beauhurst are tracking, on an agri-tech format, probably at least 250 SMEs that are actively seeking investment.

Q281 **George Freeman:** Can you drop us a line after the sitting with your best answer on those? I ask because when we asked the Secretary of State what her key metric is for deploying this £86 billion over four years, she said, "Well, there are lots—three buckets—but the big one is growth. The big metric is how much money we are attracting." It was a laudably honest answer, so I am just reflecting that. Could you let us have your best data on how much you think you are deploying—across Government, UKRI and the BBSRC—and what we are currently attracting, and what you think we should be getting that up to over the CSR?

Chris Danks: *indicated assent.*

Q282 **George Freeman:** I want to ask about Catapults and the global picture. I was a trade envoy. I was proud to launch the first agri-tech industrial strategy in 2013. I'm afraid successive Governments, including my own, have slightly dropped the ball throughout Brexit and the political instability. I do not think we have given our farmers a clear signal. But internationally—in Brazil, the Gulf and south-east Asia—there is a ton of money going into everything from disease-resistant crops and water-resistant crops to agri-tech and robotics. They know that food security is

national security. What mechanisms do we have through UKRI Catapults to deepen engagement and tech transfer?

Chris Danks: Tech transfer is probably the key to investment. Without being able to show traction and customer adoption, you will not get investment. In my mind, the two things are absolutely linked. From a UK perspective, that is what the ADOPT programme is doing: it is getting farmers to trial innovations on real farms—

George Freeman: That is a UK innovation?

Chris Danks: Yes. From the perspective of the Catapult and the UKATC, it was about acting as a middle point to use some of the national assets to demonstrate how good the tech is working. One of the key things I always find with agri-tech is that it is about working not in black and white but in shades of grey. It might work in one place but not in another. That is a big focus of what we are trying to do.

Q283 **George Freeman:** Can you give the Committee the best example—the Google or whatever it is example—of a UK agri-tech that has been nurtured by Innovate UK, raised money and is now having a big impact on agriculture here and/or globally?

Chris Danks: There are a lot, but I will pick fruit picking. Dogtooth Technologies is a company based in Cambridge that has had subsequent Innovate UK funding to support its developments, particularly in respect of strawberry harvesting. Strawberry production has changed drastically over the last five years, so that has had to evolve. The need for labour has grown in importance, to the point where they have now raised at least three significant amounts of money—all three through the investor partnership scheme that we have aligned with them. They have now raised £17 million to £20 million, and they have just deployed their first fleet into the Dyson farm. They were also the beneficiaries of a pilot and are in consideration for what we call AgriScale, which is about how you take 50 or 70 robots and start producing 1,000 robots.

Q284 **George Freeman:** Understood. That is a good UK example. Given that the big global food challenges are in south-east Asia, Africa and South America, feeding the burgeoning urban populations in the growth economies, do any of you—Innovate UK, the BBSRC or UKRI—have a relevant responsibility? Do you have any impact measurements as to how well we are doing in helping in tropical agriculture? We used to be a powerhouse in tropical agriculture. Do we have a transmission mechanism? Is that what the Catapults are doing? Who is doing that?

Chris Danks: That is a great question. I think you have seen a couple of the companies on your panels. Tropic are really focusing on bananas and rice. I would say they tend not to have used the Catapult so much, and the UK Agri-Tech Centre, because they are looking at global opportunities. They need specific conditions and to work on trials in those countries. From a genetic perspective, though, we are probably ahead of most in breeding, and leading the way on techniques that will really address the issues.

To go back to robotics, a lot of the challenge is that labour is a problem around the world. I am focusing on UK strawberries, but that same robot will be picking strawberries around the world, and then we will move into tomatoes and other areas. Certain things, such as labour on the mechanics, are significant, but breeding and focusing on certain crops is absolutely key to that impact.

Q285 **George Freeman:** I know that the Chair wants to ask about Africa, where the Gulf is investing heavily in agriculture because it does not want Africa to starve and release hundreds of millions.

Professor Ferguson-Smith, can I ask about genetics and patenting? I remember going to see Janet Thornton at the European Bioinformatics Institute, and she showed me this patent wave around the globe every day on human health. We are also patenting incredible discoveries on animal and plant health. While we are brilliant at science, how do we rank in the patenting race for innovations that will help global agriculture?

Professor Ferguson-Smith: We are very fortunate in that UKRI has really supported the use of gene editing alongside precision breeding—a real depth in genetics and crop sciences—to enhance tools that address these challenges going forward. For example, at market, we have spring barley with higher lipid levels that farmers are growing in the UK. In trials, we have vitamin D-enriched tomatoes, a camelina and a disease-resistant oilseed rape.

We have done some amazing work up in Roslin on disease resistance, such as for respiratory disease in pigs and porcine swine fever—major advances. We really want to make it easy to attract large multinationals to the UK to take advantage of these exquisite technologies that we have been developing based on genetics, genomics and plant stem cell technologies.

Q286 **George Freeman:** That is great. Does BBSRC have a tech transfer arm? The MRC had a very powerful one: MRC Technology. Do you have a way of saying, "The BBSRC want to make this intellectual property work for the world, and we license, collaborate and fund."

Professor Ferguson-Smith: We work closely with our commercialisation and innovation team to reach out to and work closely with our stakeholders to harness and support them through those next steps.

Q287 **George Freeman:** Do you know how much you raise a year off the back of the research projects?

Professor Ferguson-Smith: Not enough.

Q288 **George Freeman:** Could you come back to us with that number?

Professor Ferguson-Smith: Yes.

Q289 **Kit Malthouse:** I have a question on priorities that sparked in my mind with your example of the strawberry-picking robots. This inquiry is about food security. As much as that is obviously very clever and will contribute to growth and British innovation, strawberries are not a calorie-dense

food. The world will survive without strawberries—though it will not be quite so pleasant in the summer. How much of the funding that you deploy and emphasis in your research is on looking at calorie-dense foods?

We were all very conscious during the Ukraine war that something like 30% of world's calories were coming through the Black sea. There was therefore a major problem, particularly in places such as Egypt, with being able to feed the population with what they could grow or acquire domestically, absent that supply of wheat. If we were thinking about it rationally, we would surely say, "Our first priority should be really calorie-dense food, so that, if push comes to shove, we can give everybody the intake they need every day. Then let's talk about strawberries."

Chris Danks: That is a fascinating question, and I would not disagree. What is driving a lot of what we see from an Innovate UK perspective is the value. The horticultural sector probably receives about 40% of our funding, competitively tendered. That is primarily because, from a business perspective, you could probably raise funding for a robot for that. For lower-value produce, which is probably what you are referring to, that is much harder.

The important thing is that the technology that will be used to fund vertical farms or robotics will translate in due course across the whole of the food production cycle. But to do it at the moment, you probably have to find a premium, which is where horticulture fits. It is the thing we all like to have; it is not the most essential ingredient. Wimbledon would not be very happy if we did not have strawberries, for example. You are absolutely right, but it is the way the technology works: you start at the higher value, particularly from an innovation perspective, and it will filter down.

Q290 **Kit Malthouse:** Is that right? I worry slightly that, from this point of view, we are all a bit decadent. We are worried about the supply of strawberries or frisée, rather than worrying about a basic calorific intake of fats, proteins and carbohydrates. Thinking as an island nation, with uncertain supply chains now across the world and a, shall we say, slightly tumultuous political situation, should we be developing these crops to the extent that, if push came to shove, our basic requirements were satisfied? We could then do the decadent stuff, rather than starting at the other end and saying, "Look, we'll all have loads of great strawberries picked by robots, and sooner or later—

Chris Danks: The cost of innovation at the beginning is always high—I suppose that's it. We have seen a really good example, in a recent project we funded, from a UK-based company called Stourgarden, which is the largest and most prolific onion producer in the country and in Europe. They have started to use vertical farms, which historically would have been used for growing salads or microgreens—all those things that, as you say, are the decadent part. But what it wanted to see was whether the technology could work for onion production.

Q291 **Kit Malthouse:** I understand that. I guess what I am asking is this whether there is a guiding mind—you said there were programme

boards—saying, "Okay, we all need 2,000 calories a day. If push came to shove, how would we provide that? And then, working backwards from that, we'll put research into pigs that double in size in six weeks," or saying, "Actually, do you know what? The fastest protein we could produce at scale is chicken"—

George Freeman: Or synthetic meat.

Q292 **Kit Malthouse:** Or synthetic meat. Do you know what I mean? I don't quite want to say that it's like world war two and we should dig up Hyde Park and all start growing vegetables and eating Woolton pie, but is there anything coming down from on high that says we need to think about our calorific resilience within the UK?

Professor Ferguson-Smith: A lot of that comes from our major contributions globally to the crop sciences and crop breeding spaces, for example, where major players in the international wheat yield programme—you have certainly spoken to the CGIAR here. That is one. We also have across the UK a major wheat programme whereby all our researchers are working together to build resilient crops and crops that have higher nutritional content etc, so we are breeding that into our wheat and other grains. This is the major—

Q293 **Kit Malthouse:** Okay, but what you are saying is that that is coincidental; there is no central strategy that says—

Professor Ferguson-Smith: No, it is absolutely not coincidental. We have been investing in this for decades.

Q294 **Chair:** We need to move on, so what is the central strategy that responds to Kit's specific point about first doing the calorifically dense stuff, which is our real food security, and then moving onwards? Is there a strategy, coming from DEFRA, DSIT or anywhere else, that addresses Kit's point?

Professor Ferguson-Smith: If you are asking whether we choose one over the other, we don't; we invest in both.

Q295 **Chair:** I think you are saying that there is not a strategy, and that is an important point. *[Interruption.]* I'm afraid we do need to move on, but this is a related point, because I want to come back to international collaborations. I know that the BBSRC has invested almost half a billion pounds in international activity since 2012, and I want to understand what strategy drives those partnerships—choosing international partnerships. Who is best placed to respond on that?

Dr Bhunnoo: I will start and I am happy for others to add to this. There are a number of things we look at when deciding whom we partner with. It is about enabling people and teams to collaborate. That is one of them. Others are about strengthening our global relationships, advancing knowledge and innovation, and enabling innovation by connecting the UK with businesses here and abroad and with researchers. Enabling impact is another factor we look at, as is catalysing change through equitable partnerships. Those are the six broad objectives that we look at when we are looking at whom we partner with.

Q296 **Chair:** They are quite broad, aren't they? Are they in order?

Dr Bhunnoo: No, they are not in order. Those are just the six things that we consider.

Q297 **Chair:** Again, I am not seeing a strategy that targets food security—the basic number of calories a day in Africa or in the UK. To push back on the point you made, Chris Danks, when you said that strawberry-picking technology would ultimately be applied to low-value crops, I do not see fruit-picking technology being the best way, for the immediate future, to drive greater calories in west Africa, say. There may be a much more low-tech solution, such as local fertilisers or soil improvement. How does the strategy for international collaboration drive food security somewhere such as Africa?

Professor Ferguson-Smith: We do it in collaboration with our international partners, targeting the need to the low-to-middle income country that we are working with, or not, depending on—

Q298 **Chair:** Are you saying that they have the strategy?

Professor Ferguson-Smith: No, we co-create together. We work in partnership.

Q299 **Chair:** Which African countries are you working with?

Professor Ferguson-Smith: Kenya, for example; improved forage systems in sub-Saharan Africa.

Q300 **Chair:** Do they have a strategy for their agri-tech?

Professor Ferguson-Smith: We work together to co-create the practical outcomes for their needs.

Q301 **Chair:** Are you working with any pan-African agri-tech or food security organisations?

Professor Ferguson-Smith: Our stakeholders are—NIAB, for example.

Chair: Thank you for that. We come to Samantha now.

Q302 **Samantha Niblett:** George touched on some of this. Coming to Chris first on this, how does the UK public investment in agri-tech compare with that of similar-sized countries, such as the Netherlands? Is it sufficient for the UK to remain globally competitive?

Chris Danks: I wouldn't know the number. I know from a business-led approach that many countries I have visited rarely do that process. A lot of it is through the academic sector and spin-outs, rather than funding the businesses. Innovate in that sense is unique. I think they definitely do in the Netherlands, because they have the triple helix of Government, business and academia together, and that works.

I would say personally that the level we have been maintaining is probably appropriate, unbelievably, from the development of the innovation part of it. We should definitely be supporting that scale-up we touched on, and

the ability to raise private investment, absolutely, in more areas. We are seeing recently, with the delivery of the DEFRA farming innovation programme, a good level of consistent good applications, and we are funding at good levels. That has been consistent for the past six years, and programmes before that have done so.

From a development of the innovation part, we are hitting the right levels. The key bit, as we have touched on, is the adoption part, and being more innovative with the way we fund the support of adoption; the use of technologies like the ADOPT programme has already begun to show. That has been running for only just over a year. We will then start to see the technologies that we have been funding being deployed on-farm, and tested to see if they will stack up for the longer term.

The balance on many of the areas that we have been funding hits a natural point of scale. Whether that is by a stimulant that you are producing, a robotic fleet or a vertical farm, at some point you need to scale up. Only recently have we started to focus on funding scale-ups directly. We launched a programme as a pilot last year, and a competition called AgriScale. That is specifically to take businesses in this first call that have got autonomous or robotic solutions. Rather than develop them more, make more of them. Who do you work with? What manufacturing partners have you got?

That has allowed us to work closely with the high-value manufacturing Catapult in the UK that has huge experience of automotive, space and aerospace industries, translating that into agri-tech; taking agri-tech robots into scale-up through that expertise that the UK has. That has not happened before. We have not had the technologies at a late enough stage to start to really scale up.

On the flip side, if you are producing a biostimulant or a novel alternative protein, the scale-up needs be very large scale to have an impact on the dynamics of food. You really need to start scaling up from 50 litres, 500 litres, 50,000, 100,000 and very large scale. That is a big focus of the engineering biology funding that is going in—to look at the scale-up of those areas. That is the area where we should be increasing our funding. That is something the Netherlands has done previously with the way it has approached that and linked it into the private sector. That would be a key point.

Some blue-sky research is always required and that should be at a consistent level, looking for new opportunities, monitoring diseases and all those things—the fundamentals. But from an innovation perspective, we really need to look at scale-up and adoption.

Q303 **Samantha Niblett:** Linking that back to scale-ups, historically we are a start-up nation but not up a scale-up nation because our ideas get nicked, particularly by America. Have you seen that happening in the UK, where we have invested in agri-tech, have not previously focused on scale-up and the great ideas have been adopted in other countries?

Chris Danks: It is a great question. From the companies I have worked with in the last 10 years, no. For the ones that have moved out of the UK, it has generally been such things as access to the market or where the funding has come from. A good example of that is a company called Breedr, which was using AI for cattle sales and monitoring cattle. It got an investor from the US and the biggest market for that product is the US, so reluctantly the company did move to the US. It still had a UK outfit, but the headquarters moved. Sometimes it is drawn by the funding or where the market is.

I think we are at the cusp, on the manufacturing side, of where we are going to go, which is why we are specifically focusing to try to embed that in the UK while it is at that stage. We have a great company called Antobot, for example, which is sourcing lower-cost components and then doing all the assembly in the UK, because it needs to keep the robots at a low cost, otherwise they will not be adopted on the field.

It is definitely going to be a challenge—there is no doubt about that—but we are now at the point where the opportunity is needed, whereas previously it has not been, so we really need to step up and see how we can support that in the UK.

Q304 **Samantha Niblett:** Excellent. I assume the fact that it is always tough for our farmers to make a profit is a real challenge to the adoption of technology.

Chris Danks: Absolutely. That is one of the key things that always has to be remembered. For everything we fund from an innovation perspective, and the reason it gets scrutinised and assessed, and what we class as good delivery is: does the innovation have an impact on farm? Profitability, resilience, environmental benefits are all important, but you are absolutely right—profitability. If it is not sound economics for a farmer to use it, they will not use it. If it is not sound economics for a farmer to use it, the investors will not invest in you. So, that is absolutely key.

That is one of the areas where test beds, trials and the ADOPT programme really need to put it out into the field and really test the economic value. And you cannot do it in one year. In the UK, no two seasons are the same, so you have to then extend it to three years, at least, to get some sort of level of uniformity.

Q305 **Samantha Niblett:** That is really interesting to hear, not least because there are farmers, certainly in my constituency, who would love to adopt technology but they do not have the capital expenditure to be able to put it out there. It is about being able to factor that into the investment; part of the investment is that we do help farmers.

Chris Danks: That is where the ADOPT programme is really starting to see that, now that the farmers are seeing it. We have increased the grant size so it can be a project of up to £200,000. That allows the farmers to take the risk of using the innovation—the piece of equipment or an idea they have—and if they lose yield or have a problem, you are offsetting

that because they are getting funded to do so. That takes the risk away, although not away completely.

There was a fabulous example on the Clarkson programme, where he invested in a robot to plant onions—he has the luxury of being able to do that—and the entire crop failed because it did not rain. There is always that risk. Pioneering farmers—I think you heard from Tom Allen-Stevens—say, "I want to try it, but I need to de-risk it a little bit." That is where the ADOPT programme comes in, as well as the equipment fund and other areas—anything we can do to encourage de-risking, so they can trial it. What we do know is that through the networks of farmers, if it works for one, they will tell the next person and the next person.

Going back to your point, Chair, Cockle Park Farm, the research farm in Newcastle University, is the perfect place to convene that. It put in the first anaerobic digester. It was implied that, "You just put anything in it and it works," but that is not the case. It brought farmers there constantly to say, "Actually, you need to understand how an anaerobic digester works to get the most out of it." That needs farmer to farmer interaction and a demonstration—that will be the key. And of course, all the things we fund are not all going to work.

Q306 **Samantha Niblett:** You have already started to address my second question to you and Riaz. Throughout this inquiry we have heard that the Netherlands and Wageningen University are world leaders in agri-tech innovation. What lessons have UK institutes learned from them? You say that we are quite unique in the way that we support agri-tech innovation. Who have we learnt from and what have we learnt?

Professor Ferguson-Smith: We have a very different agricultural landscape than what they have in the Netherlands. It is much more homogeneous in the Netherlands. They do much more monoculture and more intensive greenhouse schemes; in the UK, we have a much more heterogeneous topography. As you said, across the whole country we have different soil and water compositions and so on. That is very different from what happens in the Netherlands. There is a lot that we do that adds value to what they are doing and which is very different and contributes differently our global understanding of agriculture.

Agriculture, agrifood and horticulture is a major Government priority for them and their investment is considerably greater than ours. That enables a different kind of research. However, as Chris said, we manage really well with what we have to get that added value. We also have programmes within our national capabilities around the country—for example, at Rothamsted, there is the North Wyke farm lab which provides the test grazing and does open data sharing, works with farmers and holds knowledge-exchange events. That maximises the potential of quite a diverse landscape. We are able to offer and learn different kinds of things from the Netherlands and not everything that is going on in the Netherlands is relevant to the UK.

Q307 **Samantha Niblett:** And there is knowledge exchange with them?

Professor Ferguson-Smith: Yes, absolutely.

Dr Bhunnoo: The only thing that I would add are the institute innovation campuses that I mentioned earlier. That is a similar model to what they have in the Netherlands in terms of co-locating research in our institutes and businesses and interdisciplinary working, which they do well in that triple-helix model.

One thing that differs is that we do not have Government co-located as they do in the Netherlands. However, our innovation campuses work very closely with the local innovation partnerships fund, which also takes that triple-helix approach. If there is further devolution in the future, then that will add to that. We are starting to learn the lesson of bringing Government more closely into what we are doing across those campuses.

Chair: Thank you very much. We are almost out of time, but I know that Martin has a point to make and then I also have a final point.

Q308 **Martin Wrigley:** I want to come back to what you were just talking about, Mr Danks, with the robot planting onions and then the entire crop failing. We started this session talking about 600 million people facing hunger by 2030. We have talked about optimising the picking of strawberries. You have mentioned robots where the crop actually fails. Are we not missing the point here?

Chris Danks: Absolutely, what I gave as examples show that it is an incredibly complicated landscape for food production. What works for one thing does not work for another. Whether you use a vertical farm or broadacre cropping; every one of the technologies is different. The complexity of the challenge creates the complexity of the innovation landscape, particularly when addressing all those things.

You are absolutely right to ask: if we cannot control the climate, and we cannot control the crops that it needs, then what are the alternatives? We can produce stuff indoors, although we need electricity to do so. We can also remove livestock and do it through fermentation and cultivated meats. However, those should be all choices. They should all be aspects of food production.

For it to hit the challenges we have globally, we must look at all forms of innovation and food production, because we cannot just rely on what we have previously because we can no longer trust the weather. Countries that are changing are having to adapt to different weathers. You are absolutely right, and that is one of the key bits of innovation. You would not have glasshouses if we did not have innovation, and now most things are grown under cover, with protected cropping under polytunnels and the like.

It is a difficult question, because the challenges globally are really hard. As a society, we have made some poor choices on the need to produce more food—such as destroying rainforests to do so—but we now have to stop and look at how we can do it differently. The only way to do it differently is to do it in many different ways.

When we did the programme on transforming food production, we looked at all sorts. We still focused primarily on optimising traditional agriculture, getting better efficiency, getting better value out of livestock and crop production, but also looking at insects, algae and all those different things. The need for protein will be there, and we have to look at all those alternatives. If we do not, we will fall foul, because at some point the system is going to break.

Q309 **Chair:** Thank you very much, Martin. Speaking for the Committee, we have been really impressed by the breadth of the work you are doing and by the complexity and the different stakeholders in the agriculture and agri-tech supply chains. I was very struck by your comment, Chris Danks, about doing research to support improving the highest-value crops. That speaks to a theme we have found in our inquiry of high tech versus low tech, and UK food security and global food security. You said that, if you invested in technology for high-value crops, that would apply to low-value crops. Are you sure about that?

Chris Danks: If I had a crystal ball, I would love to tell you the future. I think it is natural for any innovations to get cheaper and be more adopted—and, yes, we will see some examples of that.

A classic example is the use of GPS on tractors, with auto-steer and the like. Everyone would think that that is ubiquitous and all farmers are using it, but it is still only 60% or 70% of farmers using it. Technology does go down the line, but it takes years or decades. The key bit at the moment, or the challenge that we have, comes back to the point that George Freeman was making about investment. If you want investors to invest, they will have to invest in things that will give them a return in value. That is where the high-value comes in. It is not that companies do not want to work on those other areas; it is that the value drives it.

Q310 **Chair:** Let me just push back on that a little bit. We are talking about bringing in private sector investment, but there is also the state's purpose: to derisk and to do what the private sector cannot do. You cannot do everything, so there has to be prioritisation.

My particular concern is that for the hill farmers in Northumberland, say, improving their productivity through better grass cover or better understanding of the impact of only five hours of light in the winter—all those low-tech solutions—would be much more impactful for my region, potentially for UK food security, and for low-tech food security in parts of Africa or the developing world. How do you make that kind of prioritisation decision?

Chris Danks: That is a really great example. Sheep farming is key, and we have been funding a number of projects that are doing that.

Q311 **Chair:** But how would you make those prioritising decisions? You are telling me that you are doing everything, but you have to prioritise.

Chris Danks: Again, we are the same: we have a finite budget and we have to choose which projects to fund. It is fair to say that the way we choose them is to ask, "Will they be profitable for the end user?" In the

UK, there will be an end user. If that technology works in the UK, in many cases it will translate to other benefits elsewhere.

Q312 **Chair:** I will bring in Professor Ferguson-Smith very quickly.

Professor Ferguson-Smith: I wonder whether we have emphasised enough the research that we have done on climate resilience, looking at crops that are resistant to drought and so on, developing new crops that will—

Q313 **Chair:** I think the question is about prioritisation. You have a lot to do and limited resources. We want to understand how you are making prioritisation decisions.

Chris Danks: May I just add one thing that I wanted to raise that might be relevant?

Chair: I am going to bring in George and then I am afraid we will have to end the session.

Q314 **George Freeman:** The Minister has set out very clearly three buckets or three priorities for UK R&D spend: excellence for impact, growth and sovereign strategic missions. What we are asking is whether food security is not a sovereign strategic mission. I should declare an interest, because I chair the all-party parliamentary group on science and technology in agriculture, and we have set out a 30:50:50 plan to increase productivity by 30%, reducing inputs by 50%, in the next 30 years.

America is 40:50:50; Europe is 40:50:50. Would it not help if we had a clearer strategy for food security to create a market for these innovations?

Chris Danks: Yes, it would—

Q315 **Chair:** Great. Sorry, I am going to be ruthless here.

Professor Ferguson-Smith: Absolutely, but we are in that buckety space. We are investing in the national capabilities that build on the strengths that we have in the UK, which are then connected with our international partners to ensure that they are making a global impact.

Q316 **Chair:** Great. Dr Bhunnoo—yes or no?

Dr Bhunnoo: Yes, and—

Chair: Excellent. George, I think you have a declaration of interest.

George Freeman: As a UK trade envoy, I am promoting agri-tech strongly internationally and I advise the Pioneer Group, which has 16 sites, one of which does agri-tech support. I am helping it raise money globally.

Chair: Witnesses, thank you very much for your evidence. It has been a lively session. It is a critical area for all of us and globally, so we appreciate your taking the time this morning.

Examination of witnesses

Witnesses: Rt Hon Baroness Chapman of Darlington, Professor Sir John Edmunds, Professor Anjali Goswami and Charlotte Baker.

Q317 **Chair:** Good afternoon and welcome to the second panel in today's session—the final evidence session of our inquiry into innovation and global food security. We have a Minister from the FCDO and representatives from DEFRA. In this inquiry, we have heard that hundreds of millions of people continue to face hunger and malnutrition globally. We have also heard concerns about the UK's food security with climate change and geopolitical changes. Minister, how effective on a global stage has the UK's response been to this?

Baroness Chapman: First, I agree with the premise that there is a huge challenge globally in terms of food security—increasingly so, because of climate change and most recently the closure of the strait of Hormuz. We have still not properly begun to appreciate the consequences of that; it is going to impact, and is impacting, the availability and the cost of fertiliser and diesel for irrigation, and there is the general instability of it all.

I think we are successful, but one of the things that we have tried to do over the last year since the cuts in our ODA spending, which is the bit that I am responsible for, is really try to recognise that you can have the best intervention in the world that can benefit a small community, but what matters is scale, and scale is the real challenge with all these issues.

We are supposed to be talking about our R&D and ODA portfolio and food and agriculture, so what we have done is really bring that together from all the different Government Departments that are working on this, and we have one strategy that we have collectively agreed on. I expected it to be harder than it was, to be honest, and I have to compliment colleagues at DSIT, DESNZ, DEFRA and the Department of Health and Social Care on how they have engaged with this.

Q318 **Chair:** Do you have one strategy?

Baroness Chapman: Yes, we do now.

Q319 **Chair:** What is that strategy for?

Baroness Chapman: It is for our R&D spend through the official development assistance budget, which is used to pay for the R&D that you are interested in today. We also do other work on climate, health and other issues, but that R&D is the work that you are most interested in—although it is all related. It is always better to have more money, so I do not want to say that everything is great.

Chair: Yes, we will come to that.

Baroness Chapman: I think that teams have done a good job in being open with each other and agreeing where they want to prioritise.

Q320 **Chair:** To clarify, does that one strategy that is for the international spend FCDO and other Departments specifically cover, look at and reflect global food security? Is there a theme?

Baroness Chapman: It is not the only thing we do on food security. I think we spend about £70 million a year on food systems and security work. We work through the UN agencies, and we spend an awful lot more as part of our humanitarian work on food security, which would be separate. As far as R&D goes, John can speak in more depth about this, but I am impressed with the way that officials have come together to make this work in a more holistic way.

Q321 **Chair:** Thank you. We will come back to that in more detail. Professor Goswami, from DEFRA's perspective, how effective has our response been to hunger and malnutrition globally and in the UK?

Professor Goswami: Thank you very much. I am Anjali Goswami, DEFRA's chief scientific adviser and director general for science, data and analysis. For this inquiry, I can speak mainly to DEFRA's responsibilities in terms of domestic food security, farming systems, agrifood innovation, biosecurity, trade and SPS, and more broadly.

From DEFRA's perspective, the point is really that UK and global food security are linked, and our food security here is certainly linked in with international and global food security. The UK is very much a part of international food, feed, fertiliser and raw material supply chains, so shocks overseas can have impact, as we are witnessing now. However, domestic production is also susceptible to shocks, as we have just heard in the previous session in terms of climate change impacting the weather here and increases in extreme events affecting domestic production.

In terms of food security, there has to be a dynamic consideration of both international and domestic impacts. We need resilience in both those areas. That is certainly front and centre of thinking in DEFRA at the moment, and we are working across Government as well.

Obviously, because our primary remit is within the domestic food production area, we are looking at this from that angle. We have published multiple things recently that look at the farming road map and land use frameworks in order to think about the resilience angle in terms of geopolitics and supply chains, and also from the perspective of climate adaptation.

Q322 **Chair:** Thank you; that is very helpful. I should declare an interest as the chair of the all-party parliamentary group for Africa. We have heard that Africa may need to double food production while other regions need to increase it by over 40%. During the last panel, we did not hear a strategy for how to target agri-innovation in support from the UK. Minister, can you set out how the UK should be targeting its agri-innovation support to regions with the greatest needs?

Baroness Chapman: I come at this as a Development Minister. Yes, we are funding exciting, globally leading research into this area, and we are successful at it and have been for some time as a country. My challenge is how to get the benefit of that research, which could be into drought-resistant crops or animal vaccines—whatever it is—to be felt in some of the most difficult contexts in the world.

That is a real challenge. It is a challenge of diplomacy. It is a challenge of understanding social networks, how countries are organised, how communities function and what the links are between Governments and communities. It gets incredibly complex, but that is the job. Otherwise, you come up with something exciting but you completely fail to implement it. This is where the challenge of scale and working through the multilateral development banks and UN agencies will be vital.

I will give an example of how we have managed to do it. I was in Nigeria a few weeks ago. We have an initiative there to do with the vaccination of livestock. Communities are remote and familiarity with these kinds of intervention is non-existent in many cases, but there is a real need to get smallholders to adopt these technologies. You first need a relationship of trust because you are asking them to do things to their animals, and you are often asking them to pay for that as well. We have supported local veterinary businesses to recruit local farmers—often women—and train them in how to administer the vaccines and how to discuss the vaccines and some of the technology behind them. Some of it derives from the north-east, by the way. There is a particular disease called Newcastle disease, which I was able to vaccinate a chicken against.

Chair: You vaccinated against Newcastle disease? But we all want Newcastle!

Baroness Chapman: Correct. I was asked, "How come this disease is named after where you say you are from?" Presumably, it is because we did a lot of good work to discover it and work out how to treat it.

Anyway, the point is that through the challenge of disseminating an intervention into a difficult context, we have been training local people in how to administer vaccines. They can then set up and earn a living doing that, providing advice to people in what could be a low-trust environment. The technology is now being adopted at a far greater scale than if we had attempted to do it in a more traditional hub-and-spoke way. There are many benefits to that, around female empowerment, social cohesion and all the rest.

The point I am trying to make is that there are huge challenges to disseminating and implementing that piece of scientific innovation that we have supported in the UK, but the benefits of the implementation go far beyond just the narrow benefit of vaccine intervention.

Q323 **Chair:** That is a very well made point that the Committee is very receptive to in our inquiry into global food security, but I bring you back to the question, which was about prioritisation. Did I understand correctly from your answer that your role is not to prioritise research or innovation, even for the funds that the FCDO makes available, but to diffuse whatever is researched and innovated?

Baroness Chapman: Not quite. We had a cross-Whitehall process about setting priorities that I led. That was about geographical context and

thematic priorities. I invite John, as the scientist, to speak in more depth on that, but I did have a role in setting the framework.

Chair: In setting the priorities for the research. As we talked about, there are so many challenges, and one of the key issues is about how we prioritise what we do.

Baroness Chapman: Exactly.

Chair: You are part of that prioritisation process.

Baroness Chapman: Yes.

Q324 **Chair:** Before we go into that in more detail, in November 2025, when you set out indicative spending plans for future years, you said that the UK will be an "investor", not a "donor" in international programmes. What does that mean in this context? What is the return on our investment in vaccinating cattle in Nigeria, for example?

Baroness Chapman: Traditionally—although we have never worked only in this way—when there has been more money, there has been an ability to spend it to provide a service; for instance, to teach pre-school children, we would provide a building, teacher and some materials to do so. That is completely in parallel to the Government. Then, when that service stops, nothing is left behind. Yes, there has been real benefit to those young people, but that is it.

As an investor, you might work through multilateral banks, British International Investment or more in partnership alongside a host Government to help them to invest some of their own money as well in building a system such that even if the UK were to disappear the following year, there would still be a capacity build and an ability to deliver. That is a more modern and responsible approach to development: it benefits far more people, has a bigger impact, is better value for money for the UK taxpayer and means you have a more stable country to work with in the future.

Q325 **Chair:** That is an important clarification. That says that the UK is not looking for a direct financial return on investment. That is very helpful. You talked about partnerships. What partnerships do you have in Africa with, for example, pan-African organisations? Are you working at a very localised level with your partnerships or are you looking to partner with pan-African or pan-regional organisations?

Baroness Chapman: Just to clarify the previous point, we do make returns on our investment, but they tend to be longer term and much smaller than a commercial investor would seek to achieve. That is the point, as you should only use concessional finance, through our ODA budget, where you cannot get commercial investment.

Q326 **Chair:** But are you getting a financial return?

Baroness Chapman: Yes, we do; not always, but it does happen. We get reflows—returns that come—which we then have the opportunity to invest

in different projects. That does happen, but it would be misleading to say that we insist on that, because that is not the reality of the world we are in.

On the agencies that we work with, we do both. We are trying very much to shift more into local partnerships, because that way you do get the capacity build, you support local leadership and often you find what you do is more context relevant. We have had instances where a failure to work sufficiently locally means that our impact is less than it should be, and there are conflict places, like Sudan for example, where big agencies cannot go; they are not there. The only way we get support to people is by working through local agencies, so we do that. Probably more relevant to this inquiry is our work through big agencies like IFAD, the World Food Programme and the FAO.

Q327 **Chair:** The FAO?

Baroness Chapman: It is a UN agency: the Food and Agriculture Organisation.

Q328 **Chair:** But are any of them based in Africa?

Baroness Chapman: They are based in Rome, but they operate extensively across Africa.

Q329 **Chair:** Are you working with any pan-African organisations that are based in Africa and originate from Africa?

Baroness Chapman: Yes, we do. We work closely with the AU, but there is a valid challenge, and this is more of a geopolitical, Bretton Woods kind of discussion. There is, without a doubt, a problem with the way that we, internationally, organise—the World Bank and the UN. They have a presence in Africa, but I would say that it is insufficient. Often, the best people are based in the easiest places, if I can put it that way, and that is a real bugbear of mine. Something that I talk about a lot when I am engaging with these organisations is how we get their real, talented leadership operating out of Kinshasa or N'Djamena. Not everyone can be in Nairobi, right? There is a need to have much more of this leadership based in Africa itself.

Q330 **Chair:** Specifically for our inquiry, in terms of, say, African-based and sourced solutions for African problems, if you are working only with hyper-local organisations, you are not going to get the strong voice or experience needed to address that.

Baroness Chapman: That is true, but equally if you do not work with those organisations—it is about how you work with them appropriately and at the right stage of what you are trying to do—then you can find yourself being incredibly insensitive to local people. I know you know this yourself, but we have had issues, particularly around domestic abuse. We have tried to use apps and things, which have caused friction in households and that sort of thing, because we have not sufficiently, in the past, enabled those women to design a product themselves. It is very different,

depending on what you are trying to do; you really need to think about who the right partners are to work with.

Q331 **Chair:** I said that question was my last one, but I do need to raise the issue of cuts. You mentioned the aid cuts. Which programmes that support global food security were most impacted? Could you particularly talk about the cuts to the FCDO networks, such as business networks, many of which support British businesses to work in-country? How have these cuts impacted your programmes?

Baroness Chapman: They have; there is no question about that. In terms of R&D, Patrick Vallance was very clear with me that what you do not do is cut anything that you are committed to now because you will just wreck your reputation among the scientific community. Everything that we are doing has been cut, pretty much, with one or two exceptions, and that is just the nature of the task that I was given; we had to take 40% out of our budget.

What that forced us to do is prioritise. I think we are now spending about £40 million on R&D each year, which is a lot less than we are used to. I would like it to be more. That does have an impact, but as I say, we went through the process of putting all our commitments in front of one another, and there was a really healthy process through which we came up with those things that we are funding now.

Q332 **Chair:** Those were the cuts to ODA, but in addition, the FCDO is having cuts to all its business networks and in-country support. That must also impact the work.

Baroness Chapman: FCDO 2030 is about the fact that, even allowing for the merger of DFID and the FCO, we ended up with a headcount that had increased by, I think, 25%—it might be 21%—from what we had five years ago, although it might be longer than that. There were more people, and no one could really explain how that had happened. This is more of a question for the permanent under-secretary than a Minister, but I supported the idea of having a rethink about what we were doing. Nearly all of those increased numbers of people are in King Charles Street, not out in the network. It had become off-balance.

On the business point, DBT lead on that network. It has made its own decisions and prioritisation choices about where it sees opportunities for growth for the UK. I completely understand some of them. On some of them I think, "Oh, did you really have to do that?"

Q333 **Chair:** Can you share with us what those are, if they relate to food security?

Baroness Chapman: No, I would not want to do that, because I think that is uncomradely, but as a response to that, our teams in-country have not thought, "Oh, well we no longer do business and trade then." They have thought, "Right, business and trade ain't rocket science. We have done it in the past. What can we do together? We still have a strong team here. We have all the political connections. We have great relationships

with the business community. What can we do?" They have set up chambers of commerce in places such as Mozambique and Uganda. They have set up these new organisations for British businesses, to act as a platform. They are being quite enterprising and dynamic about it. They do not have to do that; they have chosen to do that. That is a good thing.

Chair: That is good to hear. I am going to come to Samantha and then to Kit.

Q334 **Samantha Niblett:** The Government designated agri-tech as a priority sector in the industrial strategy, yet industrial feedback we hear suggests that companies are yet to see the benefit. How will Government ensure that their strategy is translated into meaningful support on the ground? That is particularly relevant to me, as I have a semi-rural constituency and plenty of farmers.

Baroness Chapman: I would say that is a DEFRA question. I could quite happily give my view on absolutely everything, but I do not think that is what you want.

Professor Goswami: I am happy to take that question. With the recent changes in prioritisation and UKRI, which we heard about in the previous panel, agri-tech is part of the advanced manufacturing sector in the industrial strategy. It is very much viewed as a growth opportunity for the UK. The aim is for the sector to increase UK turnover in this area by about £7 billion over the next decade, up to about £20 billion by 2035.

Our main contribution to agri-tech in DEFRA is through the farming innovation programme, for which we have a £173 million investment this year. That comes through a variety of approaches. There is the broader programme. We also have the tech fund, which helps farmers invest in technologies that they can apply. There is £50 million allocated to that this year. We have the ADOPT programme, which is funded specifically to support the translation of R&D into use. That is for accelerating development of practices and technologies. We also have the AgriScale programme, which helps new businesses scale into a larger-scale business, getting over that hurdle from having a product that works to getting the manufacturing at scale. That is a variety of the topics that we cover with the farming innovation programme, which we work very closely on with Innovate UK to deliver.

Each year, we also identify a few key theme areas to focus on. This year, our focal areas will be in automation and robotics, as well as in soil and water health and quality. Those are pivotal from the perspective of long-term food security, because that builds resilience into the system. When you degrade your soils and your water supply, that will have an impact on your ability to grow food into the future. Those are some of the key areas in agri-tech that we are investing in, and this area is certainly an investment as part of the industrial strategy.

Q335 **Samantha Niblett:** As somebody who represents farmers, can I ask how they find out about this? Is it like "jungle drums" through the NFU and

through their close working networks? Some of my farmers would absolutely love to be part of programmes to help increase productivity on their farms, so how do they find out?

Professor Goswami: That is a really good question. It is always a challenge to make sure that R&D does not just sit on a lab bench, and to actually get it out into the field at scale. There are a number of things. The ADOPT programme is critical. Those are farmer-led projects to take R&D and translate it into the field. There are also, of course, a number of centres around the UK that we also engage with; the UK Agri-Tech Centre is one that is certainly focused on that translation angle, and NIAB is also very much focused on close working with farmers to do that. We also engage with consortia such as Agri-TechE, which is really focused on making sure that R&D translates into the field by engaging farmers directly.

Charlotte Baker: On the point about accessibility, we find that this is not just about finding information; it is also about the trust and confidence to apply for this funding. Farmer-to-farmer relationships can therefore be really significant in engaging uptake. Things like us encouraging farmer collaborations or knowledge sharing through some of these platforms can be as impactful as just having that information available on a gov.uk website somewhere.

The reason we were so excited to be included in the industrial strategy is that it unlocks for agri-tech the cross-Government approach to things like skills and exports, where we can then really harness the full power of Government activity. For example, on some of the work around export acceleration, we are doing great work through our agri-attachés in terms of how we export agri-tech abroad. But if we can harness some of those broader cross-Government missions, we can really get some of our companies out there and understanding the commercial opportunities in some of our key export countries.

Q336 **Samantha Niblett:** It is interesting; we heard from the previous panel that there is a real focus on scale-up, not just start-up. We were trying to get feedback, and George, who was here for the previous panel, and possibly someone else as well, was talking about how we measure what we are investing in. If the measure is just "growth", it is almost like throwing jelly at a wall, isn't it? So it is great to hear that the focus has gone on to scale-up and trying to keep things in this country.

The previous panel also raised concerns that part of the reason we have start-ups disappearing to other countries, particularly if they are invested in by venture capitalists in other countries, is access to funding and to market. So it is nice to hear that there are attempts within DEFRA to square that circle, to help farmers adopt technology and to support them with the cost of that.

Charlotte Baker: I think the inclusion of agri-tech in the industrial strategy is really looking at two objectives. Within DEFRA, the primary objective of this funding is farming productivity and profitability, and to improve some of the environmental sustainability targets that we are

committed to, while the industrial strategy brings in those other objectives around growth from a UK perspective. I think those things can be complementary. What we are looking at is, where can the farming innovation programme meet all those objectives through scaling, as you say, but also through the ability of domestic producers to access that technology, to benefit UK farming and domestic production?

Samantha Niblett: You have definitely set some cogs whirring in my head about how I can help my farmers in South Derbyshire, so thank you very much.

Q337 **Chair:** Just to clarify, are those agri-attachés based in country?

Charlotte Baker: Yes.

Q338 **Chair:** And who funds them?

Charlotte Baker: DEFRA.

Q339 **Kit Malthouse:** I want to ask a couple of questions about intellectual property. Obviously, Minister, the schemes we are funding overseas may result in IP. As a country whose economy will be dependent on IP in the future, who owns that?

Baroness Chapman: It depends.

Kit Malthouse: On?

Baroness Chapman: What the agreement is, how the project is set up—there is no one answer to that, I'm afraid.

Q340 **Kit Malthouse:** Right, so it is negotiated on a scheme-by-scheme basis.

Baroness Chapman: Yes. Perhaps I can bring John in.

Professor Sir John Edmunds: I can say something on this. We take it kind of case by case, but we invest quite heavily in CGIAR—an international agricultural research network—and, generally, new crop varieties are made openly available through them, so that others can take that IP on and use it.

Some of our research goes into animal vaccines—we tend to use an organisation called GALVmed based in Edinburgh, which sits between the researchers and private companies—to try to get local producers to make the vaccines for Newcastle disease in Nigeria or whatever it might be, and to help get those vaccines into market. That is usually based on a commercial IP arrangement, to bring commercial players in.

Q341 **Kit Malthouse:** If the Government are funding some of this stuff through the ODA budget, is there revenue flowing back on licences for some of the IP that we have retained?

Professor Sir John Edmunds: I don't think we do.

Baroness Chapman: No; our reflows would be—

Q342 **Kit Malthouse:** I thought you said that, on IP, it depends. I assumed that meant that, in some circumstances, we retained ownership of the IP. Are we just giving it all away for free?

Professor Sir John Edmunds: No, we are not. The work that we do with CG is usually openly available. In the work that we do through GALVmed, no, we are not giving it away. It is not ours; it is the IP of the people who did the research in the first place. That is generally maintained commercially.

Q343 **Kit Malthouse:** If it is overseas, it is presumably overseas companies, not British companies.

Professor Sir John Edmunds: It could be British companies, and the IP may well be owned originally by universities or research institutions here in the UK.

Q344 **Kit Malthouse:** Okay. Do we have any idea of what that IP landscape looks like for the money that is deployed?

Professor Sir John Edmunds: I don't know.

Kit Malthouse: For example, 10% is British IP, 50% is given away to foreign companies who retain the IP and make money off it—

Baroness Chapman: I hope they do, to be honest.

Q345 **Kit Malthouse:** —and the rest is given away for free. I am just trying to get a sense of what the IP landscape looks like. As you know, Minister, a huge proportion of the international seed market is controlled by a small number of conglomerates. I do not think any of them are British. Is there a strategy that means we are playing in that market in a commercial way as well as in a "We are doing good for the world" way?

Baroness Chapman: I will let others deal with UK seed and how much IP we have. I am in the business of doing good for the world—that is what I want. Through the things that we do with the ODA budget, I want countries to retain more of the value of their assets than they have been able to. That could be in extractive industries, in which resource just leaves the country with no processing benefit, or in garment manufacturing or agricultural industries. My business is to get as much of that value retained in-country as possible, because it can be reinvested and stabilise incredibly fragile countries. In the long run, that benefits the UK. I do not have a problem with the value being retained by partner Governments or businesses in other countries. That is kind of the purpose of what I do.

That is slightly different from what will motivate colleagues in other Departments. This comes together in various ways, depending on where you are working and what you are doing. It is important to understand that what ODA is used for can be quite different from some of the priorities that other Departments might be pursuing.

Professor Sir John Edmunds: Can I add something to that? It is absolutely the case that the primary purpose of ODA spend is for the

benefit of people in the poorest countries, but there could be benefits to the UK. In fact, in this area, there absolutely are, as we know. About 65% of wheat grown in the UK comes from CG crop varieties—

Chair: CG?

Professor Sir John Edmunds: CGIAR. So it flows back to the UK and is used here. In fact, UK farmers benefit to the tune of between £1.60 and £2.40 per £1 that we have invested in CGIAR, so there is a return on investment of about £2. Even if you ignore all the benefits to low-income farmers and so on, we still benefit—

Q346 **Kit Malthouse:** I guess UK overseas money is not creating IP for any of these large conglomerates to then sell back to us at a premium cost.

Professor Sir John Edmunds: I cannot be sure.

Q347 **Chair:** Maybe you could write to us on that and tell us the details—the balance sheet—of how we get that money back for every £1 for CGIAR.

Professor Sir John Edmunds: Yes, I will send you that.

Q348 **Kit Malthouse:** I have a memory that there is some treaty out there on biopiracy and all the rest of it that is yet to be ratified. Is that ratification coming forward at any stage soon? There is a treaty on this stuff sitting out there.

Baroness Chapman: I do not know about that.

Chair: Maybe you could write to us on that as well.

Q349 **Martin Wrigley:** Professor Goswami, it is great to hear you talk about soil health; I think that is the first time that has been mentioned in either panel today, which surprises me, because to me it is a fundamental thing that we need to address. You talked about DEFRA's farming innovation programme, the ADOPT scheme, and we heard some things about that from the previous panel. Where is that having the most practical benefits for UK agricultural innovation?

Professor Goswami: Across our broader R&D landscape, we are already seeing the impacts of our investments in a number of areas. That covers the key innovation areas for us, including crop genetics, which is a huge one and will continue to be. That includes precision breeding and other aspects of engineering biology. AI is certainly already making a significant difference.

Q350 **Martin Wrigley:** Can you clarify that? A farmer was talking to me about AI, and I thought, "Are they talking about artificial intelligence or artificial insemination?" No, it was avian influenza.

Professor Goswami: Yes, it is artificial intelligence in this case, which is used in combination with other kinds of innovation. If we look at earth observation, for example, using satellite data in combination with AI is already showing benefits both domestically and internationally through things like the GEOGLAM—group on Earth observations global

agricultural monitoring—network that was launched by the G20. By using systems like that, with a combination of AI and satellite imagery, you can monitor soil moisture and get really refined data on things like that.

You can also use AI in combination with engineering biology, for example, to improve genetic enhancements of crops. Robotics is another key area where we are addressing labour shortages and improving precision agriculture with more direct applications of things like nutrients. There are also improvements in fertilisers, like novel fertilisers that are better targeted to specific systems, which will increase crop yield but also reduce the environmental impact of things like excessive fertiliser use.

You can also use things like eDNA. That is a great technology that we can use to start to better understand soil microbial communities, for example, and be more targeted, as opposed to the approach that we currently use. Those are all areas where there are really exciting innovations that will directly benefit domestic farmers as well as farmers internationally.

Q351 **Martin Wrigley:** That is great. We are hearing about many of those things for the first time; we did not hear about them in previous panels. How much of that is going out through the ADOPT programme, which seems a very good sort of farmer-to-farmer push?

Professor Goswami: The ADOPT programme is quite new. It launched last year, if I remember correctly. There are about 230 programmes that have been funded through ADOPT so far. I will confess that I do not know the exact breakdown off the top of my head of which of those are going out. I would guess that the majority would be along the lines of the crop genetics; that is the one that has the longest track record.

Martin Wrigley: Perhaps it would be easier if you gave us some details in writing after.

Professor Goswami: I will do that.

Chair: Can that include the details by region as well? We discussed in the earlier panel how the opportunities and challenges differ by region in the UK, so it would be good to understand how you are addressing that.

Q352 **Daniel Zeichner:** Good afternoon. I should preface my comments by saying that both Professor Goswami and Charlotte Baker were my esteemed colleagues at DEFRA, and I was working with them. I am sure they will be keen for me to ask them about some of the knotty issues around the regulatory frameworks, particularly around precision breeding and novel foods.

This is a complicated area, but we have heard evidence from a number of people suggesting that the inconsistencies within the UK across the four nations are problematic and, of course, that the lack of harmony with the European Union and other countries is potentially an obstacle to some of our companies being able to take best advantage of the very good research they are doing. What is DEFRA doing to try and harmonise that regulatory environment to tackle some of those obstacles?

Charlotte Baker: I agree that precision breeding offers huge opportunities to accelerate the sorts of traits that protect against many of the global challenges that we have been discussing in terms of food security. As you know very well, the precision breeding regulations were introduced last November.

I think it is true that to scale precision breeding to a level at which it addresses some of these global impacts, there needs to be a degree of harmonisation both within the UK and overseas. I am sure you know that in June the EU introduced its own regulations in this space, and we are obviously currently negotiating a new SPS agreement with the EU. The details of that are subject to negotiation, but the common understanding is that there should be a short list of limited exceptions to that agreement.

More broadly, we are seeking to influence other countries. We are sharing our learning with countries such as Turkey. We are on the OECD working group on harmonisation of regulations and sharing best practice. We see this both as an opportunity to harness where the UK is clearly a leader in terms of its science and innovation base—and the unlock, if you like, that the new precision breeding regulations have enabled—but also as an opportunity to be the leaders in what will ultimately be a global movement. That would be our objective in the longer term.

Q353 **Daniel Zeichner:** That is very helpful. Obviously, the purpose of this inquiry is looking at tackling the global food challenges. This touches a bit on the points that Kit was making and the discussion with Sir John, but what are the obstacles going to be to using some of these fantastic new technologies to help tackle those big global problems? Do you see any regulatory opportunities for us there? Sir John, you might want to come in as well.

Baroness Chapman: There are so many obstacles—the regulatory ones are probably issue No. 25 in some places.

Professor Sir John Edmunds: We are working on those exact issues. There is a nice example in Kenya with plantains. Again, this is working with partners—Kenyan partners in particular—to work with their regulatory environment. It is based on a scientific approach rather than other approaches, which of course abound in many different areas for some of this.

That has allowed field trials to go ahead—I think they have started, or they are about to start—on gene-edited plantain. The problem with plantain and bananas is that they are clonal, so adapting them to different environments is a very slow process. That plantain was developed to address some sort of wilt and to address the disease.

Q354 **Daniel Zeichner:** We heard evidence from a previous panel on exactly that subject. Moving on to novel foods, the Food Standards Agency has obviously been under a lot of pressure from some quite innovative producers in the UK wanting to push ahead more quickly. The FSA introduced a sandbox approach. What is the potential for unlocking that?

Some suggest that is a potential solution to some of the major conundrums we face in terms of our own food security, as well as globally, but there is a frustration that it all seems to be taking a very long time. What can be done to speed it up?

Charlotte Baker: Sorry, can I clarify: do you mean speeding up the novel foods specifically or the regulatory approach?

Daniel Zeichner: Novel food approvals.

Charlotte Baker: That is primarily a question for the Food Standards Agency, but I think the sandbox approach to regulation has a lot of potential as a model that we can follow. The bringing together of the tech companies and the regulators to understand what is proportionate but also trustworthy, and give investors confidence to invest, is really critical.

Doing that process right can enable a speedier roll-out of these sorts of technologies at the point at which those regulations are approved, because there is confidence in the process that has been undertaken. That model is something we would like to look at elsewhere in other regulations impacting on the foods system. We can start to develop use cases under, for example, the regulating for growth Bill, which enables some of these sandbox approaches, to get there more quickly on other areas where regulation can be a barrier to speedy scale-up.

Q355 **Daniel Zeichner:** While I hear what you say about it being for the FSA, some of us might feel that, with a global food challenge on this scale, more urgency might need to be injected into this. What will need to be done to make it happen?

Professor Goswami: Can I come in on that? Novel foods are very exciting and interesting. They are certainly an area that is worthy of targeted R&D and increased pace, but I challenge that it is the solution or the dominant solution to global food insecurity. It is part of a family of solutions that also have to incorporate many of the innovations I previously talked about and building more resilience into how we grow food at present. In many cases, that is probably more translatable across the large scale in order to solve the global food insecurity problem, rather than focusing on just that one area.

Baroness Chapman: I think: if it only it were that simple. I am not sure what a novel food is—it sounds horrible—but when we look at places where food insecurity is a present crisis, it is usually because of conflict, some other sort of political instability, a lack of infrastructure, climate vulnerability, precious little cold chain accessibility or even very limited access to any form of power or electricity. There are some real fundamentals that we need to get right, as well as the issues that you are talking about. That is why the approach that we are taking now, which is about trying to look at this more holistically, is the right one, but it takes time.

The real headwinds that we are facing—I would probably point to conflict and climate as the big ones today—require a global response, but we can

bring something to that in the form of expertise, innovation and research that is led here in the UK, because we do it very well. That is a really important contribution to what needs to happen.

Daniel Zeichner: I hear what you are saying, but I do not entirely agree.

Chair: We are coming up to 1.30 pm, but we have just got a quick question from Martin and a quick question from me.

Q356 **Martin Wrigley:** We have heard a lot about the Netherlands storming ahead and doing all sorts of things. We asked this of the previous panel, but what lessons can we learn from the improvements that the Netherlands have made?

Professor Goswami: I think the Netherlands is a really interesting model, and it shows what you can accomplish when you really join things up from the beginnings of fundamental R&D all the way through to deployment at scale. The real lesson there is about linking up those different aspects.

I agree with what the previous panellists said in terms of the lessons that we can learn from it. There are probably aspects of that model that we do not necessarily want to replicate because it is so centralised, whereas what we have in this country are actually really strong regional clusters of agri-tech. For example, we have a cluster in Lincolnshire and north Cambridge on robotics and AI and high-value crop systems. We have a cluster in Warwick on advanced manufacturing, automation and horticulture. We have the Norwich Research Park, which is this amazing concentration of both businesses and research organisations looking at everything from crop science to gut health, as well as Rothamsted, NIAB and many other areas around the country.

The very centralised model that they have in the Netherlands works to some extent, but it is not the exact model that we want to focus on here. What we want is to make sure we have better join-up from the very beginning to the very end of the chain, which we can learn more from. It is about some of the programmes that I discussed earlier moving very quickly towards having that link-up.

Professor Sir John Edmunds: You rightly point out that the Dutch have some fantastic research scientists in this area. They set up a CGIAR centre in the Netherlands a few years ago to connect their scientists to the wider network. There is a two-way flow of information and expertise going both directions, and we set up our UK CGIAR centre essentially based on looking at what the Dutch had done and following that. It is not exactly the same, but we did follow their model, generally speaking, for the same purpose.

Q357 **Chair:** Great. I have one final question for the Minister and Professor Goswami. We have heard fascinating examples of high-tech solutions to global and UK food security using AI and robotics. We have also heard about the need for increased ground cover in the north-east and low-tech solutions such as just being able to keep vaccines cool. What one

technology—a low or high-tech solution—for food security would you like to be diffused globally?

Baroness Chapman: My answer would always be, can we just have fewer wars and end climate change? I just see so many communities that are displaced. But that is not what you are asking me.

Chair: That is not within the remit of the Committee.

Baroness Chapman: As I am not a scientist or a farmer, I would have to point to something around climate and disease resistance, and the ability to produce food in a way that deals with the realities. We have El Niño coming, and we have a shortage of fertiliser, so what can you do to provide food for communities in those contexts?

Chair: That could be quite high tech in terms of gene editing or addressing soil erosion—

Baroness Chapman: I would not like to say what that would be exactly; I would probably get it completely wrong if I tried to answer that question.

Professor Sir John Edmunds: We did some work maybe five years ago looking at what would be most beneficial—so for people living in low-income countries, what are the best buys? We looked at agricultural solutions, social protection, and across a whole range. What came up top by quite some margin was improved crop varieties. That was based on a study looking at over 800 studies, so we pulled a huge amount of data together. The average benefit-to-cost ratio for that was about 27—so for each pound you spend, you get about £27 back. That was miles better than everything else.

Q358 **Chair:** That is very helpful. Professor Goswami?

Professor Goswami: I would echo both those sentiments. Finding solutions that are affordable and applicable in diverse scenarios is really important. I think the key has to be focusing on resilience and adaptability going forward as we move into an era with less predictable and more extreme weather. We can have very targeted solutions for specific problems, but things that build resilience into ecosystems will be critical. Although I love really high-tech solutions, I think a lot of the solutions will be nature-based in many cases, such as improving soil health.

Q359 **Chair:** I appreciate your response—that was really interesting—but can you give me a specific example for the UK?

Professor Goswami: For the UK, it will be very much about rebuilding soil health, so looking at microbial communities and things along those lines will be really critical. To John's point, we are very much focused on plant genetic resources and building and contributing to the global network. We want to make sure that there are data and a wide variety of resources going out around the world, so that people can access new varieties of different crops that will have greater adaptability. That is another key area.

Chair: Those were very interesting answers. Thank you for the time you spent with the Committee this afternoon and for your evidence, which has been extremely interesting and engaging.