PARLIAMENTARY DEBATES

HOUSE OF COMMONS
OFFICIAL REPORT
GENERAL COMMITTEES

Public Bill Committee

GENETIC TECHNOLOGY (PRECISION BREEDING) BILL

First Sitting

Tuesday 28 June 2022

(Morning)

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not later than

Saturday 2 July 2022

The Committee consisted of the following Members:

Chairs: Esther McVey, † Graham Stringer

† Bowie, Andrew *(West Aberdeenshire and Kincardine)* (Con)
† Brock, Deidre *(Edinburgh North and Leith)* (SNP)
† Churchill, Jo *(Parliamentary Under-Secretary of State for Environment, Food and Rural Affairs)*
† Clarke-Smith, Brendan *(Bassetlaw)* (Con)
† Duguid, David *(Banff and Buchan)* (Con)
† Fletcher, Katherine *(South Ribble)* (Con)
† Glindon, Mary *(North Tyneside)* (Lab)
† Green, Kate *(Stretford and Urmston)* (Lab)
† Howell, John *(Henley)* (Con)
† Jenkinson, Mark *(Workington)* (Con)
† Johnson, Gareth *(Dartford)* (Con)
† Jones, Fay *(Brecon and Radnorshire)* (Con)
† Jones, Ruth *(Newport West)* (Lab)
† Lewis, Clive *(Norwich South)* (Lab)
† McCarthy, Kerry *(Bristol East)* (Lab)
† Shelbrooke, Alec *(Elmet and Rothwell)* (Con)
† Zeichner, Daniel *(Cambridge)* (Lab)

Abi Samuels, Huw Yardley, *Committee Clerks*

† attended the Committee

Witnesses

David Exwood, Vice President, NFU (National Farmers Union)

Dr Helen Ferrier, Chief Science and Regulatory Affairs Adviser, NFU

Professor Gideon Henderson, Chief Scientific Adviser, DEFRA

Professor Robin May, Chief Scientific Adviser, Food Standards Agency

Professor Jim Dunwell, Chair, Advisory Committee on Releases to the Environment

Public Bill Committee

Tuesday 28 June 2022

(Morning)

[Graham Stringer *in the Chair*]

Genetic Technology (Precision Breeding) Bill

9.25 am

The Chair: We are now sitting in public and the proceedings are being broadcast. I have a few preliminary announcements: *Hansard* colleagues will be grateful if hon. Members could email their speaking notes to hansardnotes@parliament.uk; I ask hon. Members to switch electronic devices to silent; and a reminder that tea and coffee are not allowed during sittings. I have also been asked if hon. Members may remove their jackets: you have my permission to do so—it is quite warm in here.

We will first consider the programme motion on the amendment paper, then a motion to enable the reporting of written evidence for publication and a motion to allow us to deliberate in private, if we so wish, about our questions before the oral evidence session. In view of the time available, I hope that we can take those matters formally. I ask the Minister to move the programme motion standing in her name, which was discussed yesterday by the Programming Sub-Committee.

Ordered,

That—

(1) the Committee shall (in addition to its first meeting at 9.25 am on Tuesday 28 June) meet—

(a) at 2.00 pm on Tuesday 28 June;

(b) at 11.30 am and 2.00 pm on Thursday 30 June;

(c) at 9.25 am and 2.00 pm on Tuesday 5 July;

(d) at 11.30 am and 2.00 pm on Thursday 7 July;

(e) at 9.25 am and 2.00 pm on Tuesday 12 July;

(2) the Committee shall hear oral evidence in accordance with the following Table:

Date	Time	Witness
Tuesday 28 June	Until no later than 10.10 am	NFU
Tuesday 28 June	Until no later than 10.35 am	Professor Gideon Henderson, Chief Scientific Advisor, Department for Environment, Food and Rural Affairs
Tuesday 28 June	Until no later than 11.00 am	Food Standards Agency
Tuesday 28 June	Until no later than 11.25 am	Advisory Committee on Releases to the Environment
Tuesday 28 June	Until no later than 2.35 pm	The Royal Society; The Royal Society of Biology
Tuesday 28 June	Until no later than 3.15 pm	Angus Wheat Consultants Ltd; Rothamsted Research
Tuesday 28 June	Until no later than 3.50 pm	Organic Farmers & Growers; Soil Association
Tuesday 28 June	Until no later than 4.30 pm	NIAB; Crop Science Centre
Tuesday 28 June	Until no later than 4.50 pm	British Society of Plant Breeders
Tuesday 28 June	Until no later than 5.10 pm	The Center for Aquaculture Technologies
Thursday 30 June	Until no later than 12.15 pm	The Roslin Institute; Genus; The Pirbright Institute
Thursday 30 June	Until no later than 1.00 pm	Nuffield Council on Bioethics; Dr Madeline Campbell, Senior Lecturer in Human-Animal Interactions and Ethics, Royal Veterinary College; Compassion in World Farming
Thursday 30 June	Until no later than 2.20 pm	RSPCA
Thursday 30 June	Until no later than 2.50 pm	Beyond GM/A Bigger Conversation
Thursday 30 June	Until no later than 3.30 pm	Professor David Rose, Professor of Sustainable Agricultural Systems, Cranfield University; Michael Edenborough QC, Serle Court Chambers; Professor Sarah Hartley, Associate Professor, University of Exeter
Thursday 30 June	Until no later than 3.50 pm	Agricultural Industries Confederation (AIC)
Thursday 30 June	Until no later than 4.10 pm	Paul Temple, Farmer, Member of the Science Agriculture Advisory Group
Thursday 30 June	Until no later than 4.30 pm	Benchmark Genetics
Thursday 30 June	Until no later than 5.10 pm	NIAB; John Innes Centre; KWS

(3) the proceedings shall (so far as not previously concluded) be brought to a conclusion at 5.00 pm on Tuesday 12 July.—*(Jo Churchill.)*

The Chair: Copies of written evidence that the Committee receives will be made available in the Committee Room and will be circulated to Members via email.

Resolved,

That, subject to the discretion of the Chair, any written evidence received by the Committee shall be reported to the House for publication.—*(Jo Churchill.)*

The Chair: Informally, I discussed with the Minister and the shadow Minister whether the Committee might wish to sit in private to consider the structure of the questioning, but both agreed that there is no need for

that, so I will not put that motion. We can therefore now commence the oral evidence session. If Members have any relevant interests to declare, now is the time to do so. No.

Examination of Witnesses

David Exwood and Dr Helen Ferrier gave evidence.

The Chair: We will now hear evidence from David Exwood, vice-president, and Dr Helen Ferrier, chief science and regulatory affairs adviser, both of the National Farmers Union. Thank you for coming this morning. I can see that you are both there—both our witnesses are appearing via Zoom.

Before calling the Minister to ask a question, I remind all Members that questions should be limited to matters within the scope of the Bill. We must also stick to the timings in the programme motion that the Committee has agreed. This session will finish at 10.10 am. With all witnesses, I will first call the Minister and then the shadow Minister, before opening up to questions from others in the Committee.

Q1 The Parliamentary Under-Secretary of State for Environment, Food and Rural Affairs (Jo Churchill): Good morning, David and Helen, and thank you very much for attending this morning. I will start with a broad question, if I may. What are the views of farmers on precision breeding and how the Bill is likely to impact across both the crop and the livestock sectors? Perhaps we will go to David first.

David Exwood: I think farmers welcome this Bill, because of the possibilities it offers. I am really clear that the big gains, the big changes, in farming are all around breeding. Yes, there are gains in productivity around my machinery, but really the exciting things in the future are all around breeding and the possibilities that brings, and the Bill will help with that.

For all my farming career, I have used pesticides as part of the process. I am very happy about that, but we now genuinely have an opportunity to produce as much food as we do now but with much less impact. So I think farmers welcome the Bill, which opens a world of possibilities and addresses the challenges we face at the moment. There is so much pressure on land use, and the ability to produce the same amount of food as we do now but with less environmental impact and more sustainably is something all farmers welcome.

Dr Ferrier: Ultimately, the market will decide whether this technology is adopted here, but I think that, before that happens, the regulatory system and the legislative process will decide whether farmers and growers have access. The technology is clearly being developed around the world, and regulatory processes are being reviewed and put in place around the world. Farmers and growers are not going to be able to access the products of the technology and realise those benefits that David has talked about if companies are discouraged or regulation is not enabling. So the impact of the Bill depends on how well it is written and whether it will be proportionate and fit for purpose and will therefore encourage the investment of breeding companies that then enables farmers to adopt the products of the technology.

Jo Churchill: I have other questions, but I would like this process to be collegiate, so perhaps we should go to others, because they may ask the same questions as I will.

Q2 Daniel Zeichner (Cambridge) (Lab): Good morning, everyone, and welcome to our witnesses. I would like to go straight into a real-world example. One example cited of a possible real benefit is in the sugar beet sector. I come from the east of England; I am sure you are familiar with the issues in that region about neonicotinoids, virus yellows and so on. Could you talk us through the potential there, but also comment on the issues that might arise in trade terms if our friends, our European partners, take a different view and what the risks might be?

David Exwood: Virus yellows in beet is something carried by aphids into the sugar beet crop in the spring and it can have a dramatic effect on yield. We saw two years ago reductions of up to 80% in the beet yield in affected fields. So that is a real-life example of a pest that can dramatically affect the productivity of a crop. We produce about 1 million tonnes of sugar beet in this country each year, and that can be dramatically reduced through virus yellows.

Through precision breeding, we have the ability to breed in genes resistant to virus yellows so that the plant just will not be impacted and all the issues of neonicotinoids and using synthetic insecticides to try to control the aphids and control the impact of virus yellows will disappear. That is a real gain in an industry that clearly needs support and could be really impacted. That is the really clear gain and potential of this technology that the Bill will allow. And there is the point about the sustainability of that business. It is such a concentrated business in a certain area of the country.

To move on to the trade environment, this technology absolutely has to be one that is used widely. I am really clear that the EU is moving on gene editing and precision breeding; it is very clear about that. Actually, my greatest worry is that the UK gets left behind on this technology. The rest of the world is moving, and we need to move with it. We absolutely live, work and trade in a European environment and a world environment, but, given that the EU is moving, my concern is more that we get left behind, rather than us moving ahead of them and nobody coming with us.

Dr Ferrier: Obviously, it is very difficult to predict, but the indications from companies are that, should this legislative change happen, it would be at least five years before products start come on to the market for farmers and growers to use. Clearly, the international trade impacts will depend on the harmonisation across trading partners in terms of the legislation in their jurisdictions. I believe that within the period necessary for those products to come on stream commercially, there will be much more harmonisation. As David said, that will also happen in the EU, which plans a legislative proposal by quarter 2 of 2023. We are not concerned about imminent trade issues, because no products are available for us to use at the moment.

The Chair: Thank you. I call the SNP spokesperson, Deidre Brock.

Q3 Deidre Brock (Edinburgh North and Leith) (SNP): Thank you, Mr Stringer. Mr Exwood, the Minister asked you about your members' views. Have your members been surveyed on the Bill, and if so, what did they say? Is there a difference in views on this matter between, say, organic farmers or small family farms, and larger farms?

David Exwood: Absolutely. We run our consultation process and work up our policy as one organisation that brings in all sectors—organics being one of them. I think everybody recognises the advantages of technology; everybody recognises the benefits that breeding brings. That goes for organic farmers and smaller farmers as well as large farmers. We have to co-exist alongside organic farming in all circumstances—we are very clear about that. We do not see that as a challenge; we already run slightly separate systems and it does not significantly alter business in any way.

The key element of the Bill for small farmers is that it is drafted in such a way as to make it as widely available as possible. It needs to be open to as many farmers as possible—that is how it will bring the most benefit. Breeding actually brings benefit to all farmers, and a good variety of wheat or sugar beet, say, is something that all farmers will benefit from, regardless of their size.

Q4 Deidre Brock: Do you agree that sufficient safeguards can be put in place to protect organic farms from what they might see as a sort of contamination—if I can call it that—from those products?

David Exwood: Yes, I do. As I said, we run existing codes, and conventional and organic already co-exist. This does not change that in any way. We have to make sure that we are able to do that. There has to be a co-existence—I am very happy about that—which is a key part of our policy and our ask. I do not see the Bill as being a challenge to that.

Dr Ferrier: The market for organic versus conventional or other systems currently enables segregation for different specifications that the market might ask for. We see that continuing to run as it does at the moment. When a buyer has particular specification, there is certification for organics. As we understand it, the certification for organics would not currently allow the use of precision bred organisms. Obviously, that could change, allowing for segregated supply chains, just as with food-grade versus industrial-grade oilseed rape, or with sweetcorn and forage maize, which are kept apart.

If you are getting a new variety of a particular crop, for example, and you grow a crop for seed multiplication purposes, the high-purity requirements for that seed are there and are managed within the supply chain. We see that continuing to apply for organic farmers.

Q5 John Howell (Henley) (Con): Earlier, you were asked about our relationship with the EU on this matter, and you mentioned progress in precision breeding across the world. How does that fit together, where is most of the research taking place, and which countries should we look at to make comparisons with the UK?

Dr Ferrier: Certainly, the most recent development in countries reviewing their legislation, and one that I think would be really useful for you to look at, is what Health Canada, the Canadian authority, has done. It has recently reviewed its legislation and put out some technical guidance. The key thing is that it confirms that precision bred organisms do not pose any additional safety risks compared with conventionally bred plant varieties. That is driving Canada's regulatory process. It is not proposing different authorisation and risk-assessment processes. It does not believe that that would add any significant benefit for consumers or the environment, because the science does not show any additional risks—that is very similar to the European Food Safety Authority opinion from the end of November 2020.

Argentina is certainly a very interesting case. Since it has put in place proportionate and enabling regulations—such as those that the Government propose in this Bill—it has seen a real increase in the number of small and medium-sized enterprises and public-good breeding R&D activities taking products through that regulatory process, so that it is not just the preserve of the largest companies that are able to pay for and absorb any uncertainty in a less ideal or dysfunctional regulatory process.

Japan is another example of where a product—a tomato—has been through that process. In countries that put in place proper regulation, the actual process is functional and works well for the companies. Those countries then see investment in R&D and into commercial companies. That is bringing through the products. South America, North America and Japan are investing in this. It is interesting to see how quickly the science develops into commercial opportunities once the regulations are right.

David Exwood: The challenges that we face as farmers in the UK—sustainability, climate change and so on—are the challenges faced by farmers across the world, and we are all looking for solutions to those problems. It is interesting that across the world, there is a move on this technology, which we are seeing quite widely. That is because everybody is looking for answers and solutions to the challenges that we all face.

Q6 Ruth Jones (Newport West) (Lab): I thank the witnesses for their time. I want to turn to animals specifically, which some people are surprised to see included in the Bill so early on. Animal welfare charities are anxious that using gene editing to improve productivity and disease resistance could lead to more intensive farming. What would you say to that?

Dr Ferrier: There is no evidence that that would be the case, but we understand that people have concerns about existing farming systems. We see that expressed, and we work hard to address it. To me, that is a separate issue from the Bill. We can have discussions about how to improve animal welfare, but I really do not think that it would be sensible, I guess, to design special elements of this particular Bill to address general concerns about farming systems.

The other important thing to be aware of is all the existing animal welfare rules and activities within Government and industry. Obviously the Animal Welfare Act 2006 applies, so we need not duplicate elements of that in the Bill, and there are codes of practice for each sector that are being reviewed all the time. Also, the action plan for animal welfare is in place, and the animal welfare pathway is being developed. We therefore think that concerns in the area, which are freely expressed, are being, and can be, dealt with through appropriate parts of legislation and industry action.

The Bill, which relates to just one particular technology, is not the place to address those areas. We have talked about the challenges. It is not just a challenge for growers of crops; there are a lot of difficulties that are climate change-related, and disease, health and welfare-related production challenges for farmers. There are genetic solutions to some of those challenges that we

would like to see explored. We would like farmers to have the benefit of them, but we will only be able to explore them if the legislation enables companies to invest in the technologies to work out whether some of them could help. We can only see benefit from using this technology to address some of those problems.

Ruth Jones: Mr Exwood, do you want to add anything specifically on gene editing and animal welfare?

David Exwood: I understand the concerns about animal welfare, but it is really important to say that with animals the ability to produce sustainability with less impact applies just the same as with crops. I have dehorned thousands of cattle in my farming career, and the ability to breed out horns in cattle is a clear gain for people and livestock. It would be good for everybody. I would be very happy if I never had to dehorn another calf again. I understand the nervousness, but there are things that this Bill will offer that are clearly a gain. It is wrong to assume that it will just lead to an intensification of production.

Q7 Andrew Bowie (West Aberdeenshire and Kincardine) (Con): We have already spoken this morning and asked a question about regulatory divergence between the UK and the EU. Your response was that you were not concerned about that so much as you were about the UK being left behind. Some of us are quite concerned about areas of the United Kingdom being left behind, given the Scottish Government's reluctance thus far to look at doing the same sort of thing that we are doing, so I want to ask our two guests: do you have any concerns about regulatory divergence within the United Kingdom?

David Exwood: Yes, we do have concerns. The main concern is that farmers across the UK should have access to this technology. I would urge that the gains we see are available to all. I understand the politics of the situation, but again I think that the fact that the EU is moving on this and has made clear signals about the direction of travel gives us some reassurance that across the whole continent we are moving to a different position on this technology. Therefore, the other countries of the UK should be looking to where everybody is moving and our market is moving, and think about how they might want to be in line, alongside what we could do in England.

Dr Ferrier: To be honest, I think it is a real shame, because clearly some of the best scientists and geneticists are operating in Wales and Scotland. There is a real strength. A lot of investment goes on under our devolved Administrations to invest in the science, but in order for there to be a return on that investment, it needs to lead to some kind of commercial adoption. It is a real shame for those scientists to consider that their work will not go beyond the lab if those Administrations' positions remain the same. I do not think this should be a political issue, because it is about recognising a technology that has a lot of potential to do good things for the environment, society, animals, and farmers and growers; it would be a shame if it were a political issue. We will see. Time will tell whether movement within the EU—which certainly for the Scottish Government, as you know, is a key place where they are looking to see what approach they should take—will change the position. It would be a shame if this were derailed for political reasons when the issues are not political.

Q8 Kerry McCarthy (Bristol East) (Lab): Would gene editing give us the ability to grow things in this country that we currently cannot? I am thinking particularly of the situation as we adapt to climate change. Is it the case that there are there crops that, because of weather conditions, soil conditions or whatever, do not flourish in the UK, but where this would mean we might be able to enter those markets in the future?

David Exwood: A key example might be soya beans. The current situation is that people have tried over a number of years to grow soya beans. Clearly, it is desirable to grow more of our own homegrown protein, but given that that is quite difficult, it is the sort of opportunity that this technology could give us—the opportunity to make varieties better adapted to our climate, so that we can grow such crops. I do not want to promise too much, but clearly breeding, as I said, offers some of the big solutions in the future. It is those sorts of solutions that we perhaps cannot quite see yet but that may well help us to be much more sustainable in what we do.

Q9 Kerry McCarthy: Is the UK is geared up for research into that side of things? We do not put an awful lot of money into food research and research on crops. I do not want to put words into your mouth. It is one thing for the opportunity to be there. Do you think that we are actually geared up for making the most of the opportunities?

Dr Ferrier: We have really excellent scientists. We have some really world-leading plant science organisations here. An example is NIAB in Cambridge, as Daniel Zeichner will know very well. The scientific capability is certainly there. Obviously, it needs funding, and increasingly research funding is seeking to enable impact from research—impact beyond the academic world, but on society and the economy. Based on that, if research funders see that there is a route to market eventually for the science that they are funding, that will increase the investment in research and development. Of course, the statutory instrument passed a few months ago will enable and make easier the R&D for these particular technologies, which is a good first step. Then, if we have a clear route to market, that will be a further incentive to explore those funding streams.

Of course, with funding comes greater capability, because research organisations are then able to recruit the best researchers. When we were doing our consultation of our members on the Department for Environment, Food and Rural Affairs consultation last year, we had scientists come and talk to our members, including a wheat scientist from the John Innes Centre, who explained the science he was doing and the potential for that to address some of our members' challenges. We have seen in the food White Paper the reference of protein crops and finding ways to get sources of plant-based protein. Some considerable investment in R&D is required in order for that to become a greater commercial proposition for growers in this country.

Q10 Alec Shelbrooke (Elmet and Rothwell) (Con): Organic food was mentioned earlier. In shops and supermarkets, organic food tends to attract a higher price than other food. Where would the costings of genetically modified food sit? Would it sit between those two or lower than the current standard food price, if you will?

Dr Ferrier: I guess we are talking about a new, not genetically modified food. I have not done a comparison of current GM foods on the market—the chocolate bars and the oils, for example—so I am not sure where they sit. Organic commands are premium partly because of the greater cost of producing organic. Maybe David could talk about that. On potential products that might come through precision breeding, it depends on the product. I think there is potential, as we have already seen with some conventionally bred products, such as a broccoli with higher antioxidant levels or eggs high in nutrients, for some premium products that have nutritional benefits, but initially there may not be any difference in the final price in shop.

Q11 Alec Shelbrooke: When you say any difference, is that from "normal" food or from organic food?

Dr Ferrier: From conventionally produced wheat, for example, for baking a conventional loaf. It depends on the products that come through. It is difficult to judge, but there are examples, such as a heart-healthy tomato in Japan that has an extra benefit that may command a premium in shops. It is very difficult to tell. I think organic always has that premium. As I said, currently that premium will include the fact that they do not use biotechnology. They do in some of their veterinary medicines, for example, but I mean in the actual production of organic food.

There is a premium for organic. I do not know whether there is a premium for GM or if it is cheaper. Clearly, if it is easier to grow a food product, there is potential to pass that on to the consumer. One relevant element that we may come to later is other requirements around the marketing of precision bred organisms. For example, extra labelling always increases the cost of getting food on a shelf. That could be a cost for the final consumer.

David Exwood: Could I just add to that? It is worth pointing out that, rather than perhaps massively increased yields, what this will increase is the sustainability and reliability of crops. Being able to grow crops consistently with less volatility is the real gain here. You will not see wild swings due to crop impact, or maybe a pest impact such as we were talking about with sugar beet earlier. Its sustainability is the great offer, and that is clearly a real advantage at a time when the global food supply chain is under pressure. That is probably one of the main advantages offered by this technology.

Q12 Alec Shelbrooke: Just to finish off on that point, then, obviously worldwide prices of grain and wheat—whichever staple it may be—have grown considerably with the situation in Ukraine. Would this actually disassociate itself from those prices, or is it still totally reliant on world events, no matter what the sustainability and yield may be in the UK?

David Exwood: It is really interesting. What is happening in the world grain market is a coincidence of problems: the political situation in Ukraine, obviously, but also production problems in the rest of the world. We have serious drought in the US midwest and problems in India, so it is that combination of climate and politics that has created the current spike in prices. Clearly, for example, if we can breed varieties that are more drought-tolerant, that will help with the food supply chain. Again, it has the potential to offer quite significant gains in the sustainability of our food supply.

Dr Ferrier: It is many years away, but I am sure these kinds of shocks will return. Obviously, whatever happens with this Bill, we are not going to have an immediate silver bullet to answer our current issues and shocks within the supply chain.

The Chair: I have three Members indicating that they want to ask questions, and we have nine minutes left, so the time allocation is fairly obvious.

Q13 David Duguid (Banff and Buchan) (Con): Thank you to the witnesses for the excellent information so far. Obviously, you represent NFU England. This is an England-only Bill, and we welcome the opportunity for devolved Administrations to take part in the process, but I was wondering, from an NFU perspective—this is for Mr Exwood—what engagement have you had with your counterparts in Scotland, Wales and Northern Ireland, for example? Is there any divergence at all between the different NFUs?

David Exwood: I can make you aware that my counterparts—the presidents in Scotland, Wales and Northern Ireland—wrote to their respective Ministers in support of the Bill, and urged them to support this legislation. I hope that gives you comfort that farmers across the UK see the benefits of the Bill, want to have access to this technology, and are urging—as Helen said—that politics should not override the clear gains here. Yes, we have consulted: we all agree as the four unions, and we would all like to see this technology adopted and available to all farmers in the UK.

Q14 David Duguid: I have another question, if I may, for Dr Ferrier. I think you said something earlier in response to Deidre Brock's question about being able to keep gene edited crops separate from organic crops, for example. Are the quality control measures that are already in place—separating seed barley from feed and malting barley, say, or different varieties of seeds and suchlike—enough to provide the safeguard that people may be looking for?

Dr Ferrier: Yes, they are. We are having to ensure that at the moment, as I said, the certification requirements are obeyed and can be delivered on. It is the same as for other things that the organic sector cannot use that the conventional sector can, or for certain specifications, so I definitely believe that the current segregation arrangements would also apply here, enabling that certification rule to be followed.

Q15 Clive Lewis (Norwich South) (Lab): I would like to come back to the labelling, which Dr Ferrier touched on. Why is the NFU opposed to this? I have heard the argument about costs being a key issue, but I would have thought that, with a new technology, you would want to achieve public confidence. Transparency and—dare I say it?—genuine consumer choice would be something that you would want initially, as the public came to terms with something scientifically different from anything else that they may have come across in recent years. Why would you be opposed to that transparency?

Dr Ferrier: We are definitely not opposed to transparency, and we are very much in favour of the notification arrangements that are set out in the Bill. That is something that we worked with Government on over a period of time—to be able to have a system within the supply chain, from breeder all the way along, as far as it needs

to go, so that the supply chain is aware of the particular breeding technology used. That enables the transparency and the traceability to be there.

We are also not opposed to labelling, as such, because a lot of voluntary, market-led labelling exists already, outside of the statutory system, enabling a retailer, manufacturer or producer to alert the public to something that it particularly wants them to see to try to persuade them to buy that product. Market-led labelling is definitely something that could be achieved, if the market demanded it at the point where products were being used, because we have the notification transparency system within the Bill.

We are opposed to statutory labelling—I guess that position is in line with DEFRA and the Food Standards Agency—because there is no scientific basis for statutory labelling for products that could have been produced through conventional breeding or natural mutations. We therefore believe that, actually, it would be misleading for consumers to have products that were labelled as different when they are not different from their conventionally bred counterparts. We are pleased to see that in the Bill—that any marketing of these products must not mislead the consumer. Of course, the food information to consumers regulations mean that producers of food cannot mislead consumers anyway. So, there is not a scientific basis for statutory labelling, and it would not benefit the consumer. It is really about the safety of the food, so it would not apply to this particular technology because all of those authorisation processes would be in place.

On consumer surveys, which are often quoted, if you ask, "Would you like this particular thing to be labelled?" consumers will generally want that. However, with lots of other breeding techniques, such as radiation-induced mutagenesis, polyploidy induction—don't ask me to explain what that means—or somatic hybridisation, if you asked consumers "Would you like to see that on a label if it is being used?" they would say yes. We need to be led by the science of whether these products are actually different if you are going to put a statutory labelling requirement in place. If the market wants to label when the time comes, that will certainly be possible with the transparency arrangements in place.

Q16 Clive Lewis: There is an argument for greater transparency in food production, not less. I am struggling with the NFU's position of leaving it to the market. Markets can do lots of things, but the reason we are here, as regulators and legislators, is to try to ensure that this has public confidence. I would have thought that the NFU would want public confidence on this. If this were the same as other food production mechanisms, I could just pack up and go home now because I would not need to be here, but clearly there is an issue. I am trying to tease out why you do not think that transparency is needed. You have made your case and your arguments, so nothing more needs to be said, unless you want to add anything in the 15 seconds you have left.

Dr Ferrier: I just do not think labelling is a way to deliver policy. It is very blunt.

The Chair: Thank you, Dr Ferrier and David Exwood, for your time and valuable contribution. We now move on to our next witness.

Examination of Witness

Professor Gideon Henderson gave evidence.

10.10 am

The Chair: We have before us Professor Gideon Henderson, the chief scientific adviser at DEFRA, who is on Zoom. For this session, we have until 10.35 am. Professor Henderson, would you like very briefly to introduce yourself for the record?

Professor Henderson: Hello, I am Professor Gideon Henderson, and I am chief scientific adviser at the Department for Environment, Food and Rural Affairs. Apologies for not being in the Committee Room with you.

The Chair: Thank you for giving us your time this morning.

Q17 Jo Churchill: Good morning, Professor Henderson. Are you content that this Bill is based on the best available science? Would you like to explain the input you have had into the Bill?

Professor Henderson: Yes, I would. I think I can reassure the Committee on both those questions. I have been involved since the very early stages of the preparation of this Bill in consulting widely with the scientific community, advising Ministers and officials in my Department and others, and talking to stakeholder groups about the science and its implications. The Bill has taken into account the science and the most expert views of it in a very diverse way. I am personally content that it is fit for purpose and will ensure the continued safety of the environment and food.

Q18 Daniel Zeichner: Good morning, professor. It is very good to see you. You will appreciate that one of the big discussions about this Bill is likely to be about definitions. I want to go into some of them, because you will be aware that some of the learned societies—the Royal Society of Biology, for instance—have questioned the very existence of the concept of a precision bred organism. Can a precision bred organism contain exogenous genetic material? If so, can you explain how that is different from a genetically modified organism?

Professor Henderson: There is an interesting question about how far deregulation into genetic technologies ought to go in one step. Some groups of scientists would certainly favour a model in which you relax the regulation much more widely and base all the outcomes on the traits that are produced through that technology—the outcome in the product—rather than having any view about the technology or the process by which the product is made. That is certainly a view that some scientists would hold.

The view of Government—this has played out in a number of stakeholder groups— has been that moving more cautiously to deregulate or lower the regulation of some aspects of genetic technologies first is a cautious and stepwise way to move. That takes account of the science, enables us to be aware of the issues as they arise, and most importantly builds the confidence of the public as those technologies are used more widely in food production. That is the justification for moving first into the use of technologies only to mimic breeding processes through precision breeding, as described in the Bill.

There is a difficulty in describing the limits of what is possible with breeding. It is clear that some things that are possible—we know they are possible because we have done them—are very similar to things that have been done, and they are therefore clearly in scope. There are other examples that are clearly not possible through breeding. In between those, there is something of a grey area. There is now detailed advice from an expert group—the Advisory Committee on Releases to the Environment—that lays out the definition of the circumstances in which something would be considered possible through breeding, and therefore would be considered a precision bred organism, to define the line within that grey area.

You also asked about exogenous material, by which I take it you mean material from another species. That sort of material can occur entirely naturally, and it can occur during breeding processes as well, but in general it does not lead to any functional change or any phenotypic change. The Bill is designed not to allow exogenous material, if it has any functional or phenotypic outcome in the product. In that way, it does mimic the action of traditional breeding. I hope that answers your question.

Q19 Daniel Zeichner: It starts to answer it, yes. I have the technical guidance from ACRE in front of me, which I will pursue with a subsequent witness. Most of us have understood that the Bill has been brought forward in order to preclude the inclusion of exogenous material. However, I think from what you are telling us that the Bill, as drafted, does not do that.

Professor Henderson: The Bill is designed to exclude the intentional inclusion of exogenous material, or the residual accidental inclusion that has any outcome that matters. That is probably the shortest way of summarising it. If there happens to be a bit of exogenous material in there that is similar to what might happen through the natural breeding process, or entirely naturally, but it has no functional outcome—no phenotypic change on the crop or the livestock—that is not considered an issue. Any intentional or accidental change that leads to a phenotypic outcome—the crop being different in a way that could not have been possible through traditional breeding—is not allowed under the terms of the Bill.

Q20 Daniel Zeichner: I think we will probably be coming back to that as we discuss the Bill line by line. Finally, what is your definition of the difference between what you have just described and a GMO?

Professor Henderson: GMO is a broad church of definition. A thing that is clearly outside of the terms of the Bill is the intentional insertion of a transgene—genes from another species—in order to create the effect that you wanted. That would be in order to make the product different in some way by bringing in an—[*Inaudible.*]

Q21 Daniel Zeichner: It is beginning to sound to me like the difference will come down to whether it is intentional or unintentional.

Professor Henderson: It is to do with intentionality, but it is also to do with the outcome—*[Inaudible.]*

Daniel Zeichner: We are losing you, but I get the drift. I will leave it there.

The Chair: Professor Henderson, I do not know if you can hear me, but you are frozen on our screen.

Jo Churchill: Perhaps we can ask Professor Henderson to dial off and dial back. Let us see if we can retrieve him.

The Chair: You are back, Professor Henderson. We move on to the SNP spokesperson, Deidre Brock.

Q22 Deidre Brock: The Scottish Government have stated that they will wait to assess the outcomes of the EU consultation on gene editing and GM. Some feel that the UK Government are rushing ahead with the Bill, potentially to the further detriment of trade with the EU. The UK Government are clearly very confident in the evidence they have received on this, because they are pushing ahead with it. Will you tell us about the peer-reviewed evidence that the Government are relying on that supports the claim that gene editing can make farming sustainable and environmentally friendly? Can you point to that evidence?

Professor Henderson: I can. There is a very wide range of peer-reviewed literature that demonstrates the benefits that can arise from the use of gene editing for precision breeding, for building better crops. The list is long and I would be happy to share a long list of some of the references. There was a review paper published in *Nature* in 2019 that I often refer back to, which summarises the many routes by which we can use gene editing to enhance crops.

I am wary of time, but I could talk at some length about the different sorts of crops that might be beneficial in this context. There is also an extensive peer-reviewed literature that demonstrates the safety of these technologies and the fact that the unintended consequences through precision breeding are generally lower than those through traditional breeding, and particularly some of the more extreme mutagenic forms of precision breeding. There is very extensive scientific literature.

You started your question by pointing to the differences of opinion politically on the different sides of the national borders within the United Kingdom. I should say that scientifically, there is not a difference of opinion as you change nations in the country and certainly leading scientists in this sector in Wales and Scotland have also been very instrumental in the peer-reviewed literature that I have mentioned, and they agree with the sense of direction of this Bill, although their political leaders do not.

Q23 Deidre Brock: And the potential impact on trade with the EU?

Professor Henderson: As a scientist, trade is less my area of expertise, but to some extent you could argue that this Bill would enable more trade, because it will enable better crops and more crops to be produced, and therefore they could be more readily traded overseas, giving more market opportunities for UK farmers and markets. *[Inaudible.]* Therefore, I do not see an immediate problem with any trade with the EU, either.

It is also true to say, as I believe your previous—*[Inaudible.]* Sorry, are you still there?

The Chair: We are. We missed a little towards the end there, Professor.

Professor Henderson: I am sorry; if it happens again, I will switch wi-fi on to my phone. I do apologise.

I was saying that, from an EU perspective, the final thing to say is that the EU itself is of course consulting on changing the law in a way similar to the way that we are considering, and it is quite likely to change on the same timescale that we will be producing marketable crops.

Q24 Ruth Jones: Thank you, Chair, and thank you, Professor Henderson, for your time this morning.

I note in the Bill that the definition of "animals" is not restricted to farm animals; therefore, it follows that it is obviously not just farm animals that we are talking about here. I just wondered what you see the Bill actually covering in terms of applications beyond farm animals—what sort of areas do you see the Bill taking us in?

Professor Henderson: I am sorry; could you repeat the question, please?

Ruth Jones: Yes, okay. In the Bill, the definition of "animals" is not restricted to farm animals. Therefore, it follows that if we are not just talking about farm animals, we are talking about animals outside farms. What sort of applications you were thinking of? As you said, you have been involved in the development of this Bill. What sort of areas are we looking at in terms of the application of gene editing here?

The Chair: Did you hear that question, Professor Henderson?

Professor Henderson: I heard something about—*[Interruption.]* The application for animals outside the farm is something that will need to be addressed before secondary legislation can be enacted. It is not something that I am willing to discuss now, because I—*[Interruption.]*

Ruth Jones: I am sorry, Chair; I cannot understand the answer.

Jo Churchill: I understand, Gideon, that you are on a visit. May I suggest, with the Committee's indulgence, that we slot you in on Thursday, if people are agreeable and you have the time? Your evidence is both welcome and vital, and we would like to hear from you.

Professor Henderson: Again, I can only apologise for the bad wi-fi I have here. I would be happy to come back to you at any time that suits the Committee.

Jo Churchill: Thank you.

The Chair: We have 10 minutes left in this session, so let us have one more try. If that is unsuccessful, then, with my co-Chair, we can consider changing the programme motion. We have agreed a programme motion so it would have to be formally changed. Will you ask the question again, Ruth?

Ruth Jones: Did you hear the question, Professor Henderson?

Professor Henderson: I think your question was to do with animals that are not on farms—non-livestock animals—which I take to mean things like pets. In that area, there is a piece of work still to do to ensure that animal welfare is looked after and continues to be well looked after following the passage of any Bill on precision breeding. That is a piece of work that scientific information will need to feed into.

There is a body of evidence on animal welfare, including on-farm and off-farm welfare. That is a process that I believe will have to take place before secondary legislation can be enacted. The process for that is laid out in the Bill, and the timescale will be something like two to three years where scientific input will feed in.

Q25 Ruth Jones: Just to be clear, did you say this piece of work will take two to three years to take place?

Professor Henderson: That is our expectation.

Q26 Kerry McCarthy: Continuing on the animal front, we know that some animals, such as pets, including some of the brachycephalic dogs, are bred to have traits that are not desirable from a health point of view. There is increasing concern about the popularity of pugs, French bulldogs and creatures like that. On the farm animal side, you have poultry that is bred to an immense size and cows where the milk yields are going up year on year—they are bred to produce more than they would naturally.

What do you see as the parameters of that? How will the Bill protect animal welfare? Because of the popularity of those dogs, breeders may make use of the new technology to breed even more extreme examples. Would that be desirable? How can we prevent that from happening? You may have answered that in response to my colleague and said that it needs more time, but how do you see that in terms of the desire for increased yields and increased production on farms? Is there not an argument for not including animals in the Bill while this further research takes place?

Professor Henderson: Scientifically, the application of these technologies to cross to livestock or other animals is identical in terms of the changes it can cause. It can mimic the impact of breeding more efficiently, effectively and rapidly. In the livestock and animal area, this has identified more clearly a problem that was already there and the fact that we know, with respect to animal welfare, there are some negative outcomes that come from traditional breeding processes. If we are able to speed that process up through precision breeding, those negative outcomes may occur more quickly.

The passage of this Bill has pointed to those problems in animal welfare and made them clearer, and made it necessary to deal with them quite explicitly before we can enact legislation about precision breeding for animals. That is not because the science is different but because the existing regulation around animals differs from that needed around crops. That is why the instrument is set up as a secondary instrument, so that there is time to fully consider and deal with the animal welfare processes before that is changed in law.

The Chair: Thank you, Professor Henderson. We will end the session there. It has been a difficult session because of the technology. I will consult the Front-Bench spokespeople and we will consider whether to change our programme motion and possibly invite you back, if you would be good enough to return. Thank you for the information you have given us and for your time.

Examination of Witness

Professor Robin May gave evidence.

10.30 am

The Chair: We now come to Professor Robin May. We have until 11 am, so we have gained five minutes. Thank you for giving us your time and expertise this morning. Could you briefly introduce yourself?

Professor May: Certainly. I am Robin May, chief scientific adviser at the Food Standards Agency and a professor of infectious disease at the University of Birmingham.

Q27 Jo Churchill: Good morning, Professor May. I will start with a broad question. Why is it necessary to create a new regulatory framework for precision bred food and feed products, and how will the FSA balance safety in doing so?

Professor May: There are probably two answers to why this is necessary. Currently, precision bred foods and feeds will be encapsulated within the existing GM framework. If they are moving out of that framework, it is important to be sure that those products are safe. The key difference here with traditional breeding is one of pace. The entire point of this technology is to do things that could have been achieved through traditional breeding, but much faster. It is important that we have safety checks along that pathway.

On your question about balance, I think the key balance to strike here is between supporting innovation and ensuring safety. At the moment, our thinking around this is to have a two-streamed process for regulation, where there is a very light-touch process for anything where there is unlikely to be a substantive change in the food and more scrutiny of anything where the final food product is different. I think that is quite appropriate for this blend of technology.

Q28 Daniel Zeichner: Good morning and welcome. You may have heard some of the previous discussion around labelling. Indeed, it is something the Food Standards Agency has looked into. Could you tell us what work the Food Standards Agency has done on assessing the public view on labelling and what conclusions you have come to?

Professor May: We have undertaken quite a lot of consumer research in this area, as have many others. There are various take-home messages from that. The first is that there has been a perceptible shift in public views over the last 10 or 20 years, and there has been more interest in the potential benefits of this technology. That is mirrored by a really strong view that the public want some level of regulation and safeguards in this and other genetic technologies.

Specifically around labelling, there is a very strong majority of the public that we have polled, and that others have seen, who would like labelling of these products. There is some difference of views about what that labelling should entail, but there is a strong feeling around it. From an FSA perspective, we would in principle support that, because we stand very strongly for transparency. The problem, sitting here as a scientist, is that this is not really achievable for this particular group of foods, because the entire nature of the precision breeding legislation is to consider things that could have been produced traditionally.

Consequently, you may end up in the future with two apples, for instance, and one was produced by precision breeding that involves gene editing and the other was produced by traditional methods. It would be scientifically impossible—at least, at the moment—to tell those two apart.

Then, from my perspective, my view is that a label that is not enforceable and that might be misleading is actually worse than no label at all, because you then start to spread doubt about the validity of other labels in the food system: allergen labels, nutritional labels. While in principle I think labelling would be a good thing, the fact that we cannot enforce it makes me feel that this is not appropriate for this type of food.

Q29 Daniel Zeichner: Could you say a little bit more about distinctions between the new nutritional labelling and the other labelling? I think that is important for the Committee to understand.

Professor May: Labelling in the UK is quite a complex system. There are different legislative responsibilities in the different devolved Administrations, for instance. Broadly speaking, there are a whole variety of things, as we know, on a food label. The most obvious that most of us look at are things such as calories, fat content and salt content. There are very tight legal guidelines around what must be present on the label and that it must be accurate. Clearly, if you say that it contains 6 grams of salt and it contains 7 grams, that is not legal.

That holds also for other aspects. There are safety aspects of labelling, such as allergen information, which is critical for many of us, and country of origin. Then there are a raft of labels that may not have a legal framework, but which have recognition under guidelines—Red Tractor and animal welfare standards, those kinds of things. There is quite a lot on the label already. Under the current legislation, any food that is approved as a genetically modified food is labelled as such.

Q30 Daniel Zeichner: May I press you on one final example that has been brought to my attention? It is one of a tomato that could be genetically edited to boost vitamin D content, for instance, and then the cases where some people sadly have an issue with vitamin D. Is there a danger that we could end up not alerting those people to those problems if we do not label properly?

Professor May: That is a good example of somewhere where I think we would have a different approach. Just to go back on the approach we are currently proposing—I stress that there is nothing set in stone yet. This is an approach that we are working quite closely on with our advisory committee on novel foods and processes to develop firm guidelines. At the moment, our thinking is around this two-tier process. Tier 1, for instance, would be foods where there is no compositional change in the thing you eat. A strawberry with a different root system, but the strawberry itself is identical, would not need substantial regulation. In contrast, with the vitamin D tomato that you mentioned, the thing you eat is now different; there is vitamin D in there. Those would be risk assessed and under that risk assessment the key issue there would be one of safety.

In an example such as that one, where there may be a subset of the population for whom this is dangerous, absolutely, we would incorporate that into the risk assessment and our guidance to Ministers then would be that it would be entirely right and appropriate to label that food, possibly with a label that says, "Not suitable for certain groups." You could imagine a scenario where a food is not suitable for pregnant women, for example, and we would certainly stand strong on the fact that the bottom line is that the food needs to be as safe as it is today. Anything that might compromise safety should clearly be labelled as such.

Q31 Daniel Zeichner: All that is very interesting and very good, but I do not actually see that this is covered in the Bill as it stands. This is all going to have to follow through secondary legislation, is it not?

Professor May: That is correct. At the moment, part 3 of the Bill encompasses the direction of travel, but not the details. That is something we are working on at the moment.

Q32 Deidre Brock: Food Standards Scotland produced a paper in March of this year that pointed out potential for regulatory divergence between the four nations of the UK and that the Bill could result in Ministers in England taking decisions on the approval of genome-edited food and food products with little or no involvement from Food Standards Scotland or, indeed, Ministers in Scotland. It is an independent authority, as you know. Can you tell us how that relationship will be approached and managed, if the Bill becomes an Act?

Professor May: Happily, I am here as a scientist, so I can say that, scientifically, we have an extremely close working relationship with FSS and other regulators around the world, but the closest is with FSS.

If I give an example, at the moment, risk assessments that we might do in FSA are shared very closely with FSS. All that process is done together. Often we are using the same sets of experts—for example, to provide information. Once the risk assessment is done, it passes to a risk management process. I cannot think of an example where there is a difference in the risk assessment part between nations, because the science is the science.

Where there are sometimes differences is in the risk management area. A current example is raw drinking milk, because the science around the risks of drinking such milk is the same, but England and Scotland have different views on how much risk is acceptable. Under this framework, I would fully intend that we would share all the science around the risk assessments of a precision-bred product. Ultimately, though, the decision on a risk management basis and whether to authorise it would fall to Ministers in each of the individual countries.

Deidre Brock: That is helpful. Thank you.

Q33 Ruth Jones: Thank you for your time this morning, Professor May. We heard from a previous witness that the EU is likely to develop its work on gene editing along similar timescales. Given the need to share information, how will the FSA and the European Food Safety Authority share information as we go down this path?

Professor May: Previously, prior to Brexit, everything was handled at the European level. As I just mentioned, we share informally the scientific advice, which is very international. Often the people who are providing evidence for a risk assessment are the same people—they may not even be within the EU, but wherever that expertise is available in the world—so there is quite a lot of sharing at that level. Currently, our only formal arrangement with the EU on food safety is around alerts. An alert for a food safety issue that may have an impact on the UK is passed to us, but something that affects countries outside and has no impact on the UK would not necessarily be shared.

I think all of us hope that there will be a reciprocal arrangement for sharing information in future. It is in everyone's interest to share as much evidence and data as possible, but that is obviously not in my gift to control. There is recognition in the EU that the current GM framework is not fit for purpose for these kinds of products, so the process is already rolling in the EU to look at how it might be changed. How long that will take, and what the outcome might be, will obviously be very different. I would anticipate that it is going to take longer than it will in the UK to get resolution on that.

Q34 Ruth Jones: You mentioned alerts. Obviously, nobody wants to leave it until there is an alert situation, but what about developing more formal mechanisms as we go forward, rather than relying on the good will of scientists?

Professor May: Sitting here as a scientist, obviously I hope very much that there will be good sharing. As I said before, it is in everyone's interest to share the best science and the best evidence around this. Happily, building those relationships is not in my purview to organise, but I hope that there will be sharing, particularly around the horizon-scanning function. For us as a regulator, it is really critical to think about not just what is on our desks now, but what will be there in two, three or five years' time. What is the science that we will need to assess the potential risks of products that I have not even thought of yet? Collaborative agreement around what might be coming down the road is really critical for all of us.

Q35 Deidre Brock: Something occurred to me when I was looking at the Bill again last night. Do you feel that you have sufficient capacity to be able to cope with the extra responsibilities that you are taking on? Have the Ministers given you further guarantees that you will be supported in that?

Professor May: That is a very good question. It is hard to predict based on the estimation of what might be coming to our desks. On the one hand, the Bill will remove a tranche of products that would otherwise have been assessed as GM products. We already regulate GM products, and there is the capacity. On the other hand, the purpose of the Bill is to stimulate development in this area, so we may end up with a lot more applications, in which case we are going to need additional resource. We have taken steps in that direction, including recruiting independent experts in this area to provide scientific expertise, but if there were a large volume of applications needing consideration, we would need additional support.

Q36 Kate Green (Stretford and Urmston) (Lab): Good morning, Professor May. To return to the discussion that we were having a few moments ago about information for the consumer, to what extent does the Food Standards Agency have a role in providing general public information and education? If that is not the role of the FSA, who should be doing it and how important is it?

Professor May: Our statutory mandate is to protect consumers and represent their interests as they pertain to food. That includes a communication role ranging from allergy alerts and food withdrawals through to a more nuanced understanding of the food system—food security, food poverty and those kinds of questions. At the moment, we do a fair bit of public communication around issues that we know consumers are interested in. Precision breeding, on which we have done some work, is a good example. An explainer on what genome editing and precision breeding are, and what impact they might have, is available on our website, for example.

We do a limited amount of work with schools—particularly in some regions of the UK—mostly on food hygiene. There is an opportunity to do more to explain to people the honest truth about food, and to help them to make decisions about safety and their purchasing decisions in that space. There is always room to do more. There is a lot of consumer interest in this class of foods, and I anticipate that we will do more to make sure that people have the facts about it that they will want.

Q37 Kate Green: To what extent would it be your responsibility to intervene in the event of misinformation? We are particularly concerned now about online misinformation.

Professor May: That depends very much on the type of misinformation. Local authorities usually enforce in that area. When a product is not what it says it is, for instance, it gets seized or withdrawn from retailers at local authority level. We issue alerts, and we have a national food crime unit that is very actively involved in looking at deliberate crime in the food sector, including people selling things that should not be sold or that are misrepresented. We also do quite a lot in the detection and enforcement of large-scale issues, including supply chain problems, incorrect labelling and so on.

In the case of precision breeding, it will clearly depend on what Parliament decides, but if there were a regulation on labelling, we would need to look carefully at how that responsibility goes out to the different regulators. We would undoubtedly have a view, and we would issue information for local authorities to enforce on what should and should not be on a label.

Q38 Daniel Zeichner: I have two sets of questions. First, I want to go back to labelling, because I have been mulling over your response. Is the objection to labelling the two apples that you cannot, at the moment, have a test to tell them apart? Is that, in principle, the reason for not labelling, or is there another reason?

Professor May: That is exactly right. As the legislation stands, you might introduce what is called a single base pair chain—a tiny, one letter change in the DNA code of that apple. Those single letter changes happen all the time. If you have a field of apple trees, they will all be slightly different, even if you cloned them all initially, so we would not be able to take that apple, sequence the DNA and definitively say, "This one was created by someone using genome editing, and this one just turned up by chance in the field." As you cannot tell those two apples apart, if there were a label on one saying "Precision bred" and a label on the other saying "Not precision bred", I could not, as a scientist, say that that was true. That therefore raises questions in my head about why you would have a label if you cannot be sure, in the first place, that what it says is true.

Q39 Daniel Zeichner: I get that, but if there were a genetic marker that you could identify, would that give you a mechanism for doing that?

Professor May: In principle. There are ways that you might do that. One way that some developers are thinking of—in the context of protecting their intellectual property—is to make that single letter change in a background of lots and lots of other single letter changes that you already know, as a kind of barcode. Then, the concept would be to mount a defence, so that if someone steals my apple, I would be able to say, "But this apple that you are selling has that single letter change, and the other 15, all of which were in my original stock apple, so this is my apple, not yours."

That is a reasonably good way of protecting intellectual property if you are trying to claim that something is yours. It is very difficult to use that the other way around and say, "That is definitely precision bred." I could be growing my apples and say that those 15 changes occurred spontaneously. Again, it is not currently possible to say definitively that they cannot have appeared naturally.

Q40 Daniel Zeichner: Thank you, that is helpful. My second question is about the register established by the Bill, which the Food Standards Agency is required to maintain. The Bill is fairly light on explanation as to the purpose of the register. Could you explain what you think its purpose is and who is likely to use it?

Professor May: The idea behind the register is to have a public awareness of the products that are going through this pathway and are ultimately out on the market, in a similar way to the public registration of foods at the moment. To take a current example, if you applied to us with a novel food, you would apply with a dossier of data that says, "This is the food. This is how I produced it. Here is how I have considered safety risks." At the point that we say the dossier is complete and sufficient for us to consider, we publish and say, "This company has put its proposal in. We are now considering that product." In the fullness of time, we will either recommend approval or not for that product. If we recommend approval, that will get registered publicly as well, so people can see what this novel food is and where it came from, and be reassured that there has been a due process behind it.

My view as a scientist is that this should be the same for precision breeding. We should have a register that says, "Here is a product that has been considered. We have looked at it; it hasn't rocked up without any kind of due diligence around it." It is there in the public domain for people to see what process it has gone through and be reassured that those products have had some level of scrutiny.

Q41 Daniel Zeichner: I am slightly sceptical here. I imagine one of my constituents going into a garage and buying a chocolate bar that was produced with some genetically edited sugar grown in eastern England. I am not convinced that they would check the public register to find out whether that product had been produced in this kind of way. Is the register really aimed at consumers?

Professor May: It is aimed at some consumers, and that is true now. On average, most of us spend less than six seconds considering each food item we purchase in the supermarket, which is not enough time to consider the label. Some consumers, depending on their concerns, spend more time looking at labels. If you are an allergen sufferer, you spend a lot of time looking for allergens. If you are a vegetarian, you check that the label says it is vegetarian. We know most consumers are a bit uninterested in some of these issues, so they probably will not stop in that garage and check whether the product is on the register or not, but there will be some consumers who have strong views on this, and they may or may not wish to purchase something accordingly. It is important that

the information is available for them, so that they can pause if they want to and find out. Even if most people do not, it is available, should they wish to do so.

Q42 Daniel Zeichner: But that is the difference between having it on a label and on a register, isn't it? A register requires a bigger effort to check, frankly.

Professor May: There is a slight threshold—yes, that is true. That is not unique to precision breeding. People are quite rightly demanding more and more information about their food. The labels are not getting any bigger, and certainly my eyesight is getting worse, so there is already a shift, and we see that. Many of us are doing more and more of our purchasing online. We actually never look at the sticky label on the food item because it is on a webpage instead. People are getting more used to looking elsewhere for information, so it is not the hurdle it used to be. You are quite right: there is a limit on how much we can fit on a physical label, and it is jostling for space with allergen, nutritional and the country of origin information, so there is limited real estate on the back of the label to get this information across.

Q43 Daniel Zeichner: But as far as you understand it, the purpose of the register is to give that public reassurance. It is a public information issue.

Professor May: That is correct, yes.

Q44 Jo Churchill: What learnings have you taken from looking at countries that already have taken this technology forward? I am thinking in particular of Canada, Japan and Argentina—places where we holiday and are very comfortable with eating foods there. What have we learned from looking at other countries across the world, and how have you referenced that learning in the proposal you have put forward?

Professor May: There is a range of approaches across the world. It is probably true to say that no two countries have exactly the same approach at the moment. Perhaps I may give some examples.

At one end of the scale, you would have the current approach in the European Union, where all genetic modification, even genome editing that would fall within precision breeding, is regulated as GM and goes through a full risk assessment, often involving toxicology and quite a lot of analytics. At the other end of the scale, you have the US, for example, which has a default setting: if it is similar to something that was traditionally bred, there is no regulation.

Perhaps in between, the Canadian example is an interesting one. In Canada, they regulate the product and not the technology that has created it. They ask—let us go for an apple—"If you have created this apple, is it different from an apple I can buy currently?" If it is not different, it is not a novel food and it is not regulated; if it is different, it is a novel food and it gets assessed, regardless of how you made it. If I made that apple by precision breeding and it is different, it would be regulated; if I made it by crossing two apples in my orchard and creating a new apple tree that was different, it would still be regulated through that process. Scientifically, that is a very valid approach, but it means that you encompass within it all of traditional breeding and all the things that are done but not regulated in that way in this country.

The Chair: That brings us to the end of this session. Thank you for your time, Professor May, and for the contribution that you have made.

Examination of Witness

Professor Jim Dunwell gave evidence.

The Chair: Good morning, Professor Dunwell, and thank you for giving us your time. We will finish this session at 11.25 am. Will you introduce yourself briefly?

Professor Dunwell: I am Jim Dunwell, professor of plant biotechnology at the University of Reading. I am also chair of ACRE, the Advisory Committee on Releases to the Environment, and have been for the past nearly three years.

Q45 Jo Churchill: Welcome, professor, and thank you for coming this morning. One of the challenges is that people hear that this will be swifter, and that concerns them. However, does the increased speed of the precision breeding method make the technologies less safe?

Professor Dunwell: Absolutely not. Some people suggest that speed, when it is applied in this kind of science, somehow has an intrinsic risk attached to it. That is slightly strange, as in most areas of science and innovation we are striving towards efficiency, whether it be in producing better vaccines or better batteries for electric cars. We are in a competitive world, and we can be sure that, as a nation and a scientific group, we are up against people who are having the same discussions elsewhere. If you are a plant breeder—not that it is a particularly profitable business—the ones who are successful are those who make genetic gains more efficiently and more quickly. Ever since we have known how genes control plant development, there have been advances in plant breeding to try to go through generations more quickly, so that people can capture, create and select genetic variation more quickly, and get their products to market more quickly. This is another element in that, which allows further increase in efficiency. Therefore, I have no intrinsic doubt about it.

Q46 Jo Churchill: Have you identified any greater risks involved in precision bred organisms, when compared with traditional organisms?

Professor Dunwell: No, not at all. It is something that ACRE as a group has had discussions about in the past decade, saying that the traditional methods of regulation were not really keeping pace with the change in the scientific information. Some 10 years ago nearly, we produced a report leading the way on that. Some of those issues have now fed through into the present proposal for regulation. Something you do with gene editing is to make slightly different, smaller genetic changes—that is the precision—enabling you to take a good variety and make it slightly better, just by making an existing change. In the past, you would have to put together different hybrid combinations. You would then have to go through massive selections of the best progeny, and that takes time. In terms of breeding a new variety, it may take five, eight or 10 years. That, now, can be cut back substantially.

Q47 Jo Churchill: I hope the Committee will indulge me as I ask my final question. Is this a good time to be bringing this legislation forward, given that you have highlighted to the Committee that we perhaps needed to look at our regulation a decade ago?

Professor Dunwell: I think it is very appropriate. Obviously, it follows on from our removal from the EU. As for the legal case that created this, I suppose, concern, most scientists in the UK and the EU realised that it was a sort of perverse judgment when it comes to traditional so-called mutagenesis, where you apply chemicals or radiation—that is considered a traditional method and has been for 50 years. If you go back to the '50s, there was a society of atomic gardening. That was when atomic energy was "good". There was a very popular and interesting character who set up the atomic gardening group. She used to demonstrate her plants at Chelsea; she used to have dinner parties and carry round irradiated peanuts to offer to people. It was considered a good thing, but it was a complete unknown. But there was no evidence of any problems relating to it. We can now make particular small genetic changes in a much more precise way, and I think it is a good time for the UK to take a lead and apply the best scientific principles that we have at our disposal.

Q48 Daniel Zeichner: Welcome and good morning, Professor Dunwell. I am going to try to pursue some of the vexed issues of definition at the start of the Bill, and I will ask you first the question that I asked Professor Henderson earlier. Can a precision bred organism contain exogenous genetic material, and if so, how is it different from a genetically modified organism?

Professor Dunwell: I think this comes back to our understanding of genomes. Some of the wording in here comes out of the discussions that we have had within ACRE and the recognition that, probably 20 or 30 years ago, we assumed that one crop had one genome and that was it, but we now know, because you can sequence genomes very easily and quickly, that in fact there is an enormous underlying diversity of genetic material. The number of genes in one variety of maize or corn is different from the number of genes in another. There are also structural rearrangements. You can have great pieces of chromosomes interchanged or moved; it is still a maize plant. These so-called structural variations are an intrinsic part of plant breeding—and also animal breeding. The more we see the diversity of this variation, the more we pick up the fact that many, many plants have DNA that has come from other organisms throughout their evolution; it is the same with animals. Plants have segments of DNA from, say, virus infections hundreds or thousands of years ago perhaps. They have been incorporated into the genome and so, in old-fashioned definitions of GM, those organisms would be considered genetically modified organisms, because they have material from another organism in them. But we accept now that that is the baseline—that many, many organisms have small parts of DNA from many, many organisms. We have nematodes that have plant DNA. We have insects that have plant DNA. These have been moved around during evolution. They do not change the purity of the species. In evolutionary terms, they create the diversity that enables evolution to take place.

That is the background in which the term "natural transformation" has been created. The simple presence of a small fragment or a bit of DNA from another species, which might have been there anyway, is not something that has any impact on hazard or risk.

Q49 Daniel Zeichner: That is helpful. The problem that I and others have with the Bill is that it was explained to us at the outset as addressing a particular issue—allowing gene editing within one specific species. The assurance given was that it would not open the door to transgenic material being introduced, but I have to say that from hearing the evidence of you and others this morning, and from looking at the Bill, I am not entirely sure that is what it does.

I want to press you a bit further on some of these vexed issues of definition. We have "precision bred organism", "qualifying higher plant", and the EU now has "new genetic techniques". We have three new definitions, which the learned societies have suggested in their evidence do not really mean very much. I may be being slightly unkind, but they are not very precise in their definition. The evidence that your committee, ACRE, produced to give guidance, which unfortunately came after the statutory instrument a few months ago, makes for very interesting reading. I will not read it all out—I assure you, Mr Stringer—but it is a very nuanced account of how you might go about coming to conclusions about what any of these things are, but it lacks precision and certainty. As legislators, we are trying to put into a Bill some fairly precise definitions. Am I wrong about that?

Professor Dunwell: No, it is a nuanced approach. It is nuanced because it takes account of the developing science. That is something that our committee does; part of the responsibility of all committees is horizon scanning. We want to see where techniques that we think of as traditional now are in a few years. There will be even better means of changing not just bits of DNA, but perhaps epigenetic effects, which is where you change not the sequence of the DNA but whether the DNA is expressed in a particular cell. That can also have an advantage.

What you see in these definitions is something that takes account of the advance in science. As I said, it takes account of the background genetic variation that exists. There were a couple of papers recently in *Nature*, for which something like 50 potato genomes were sequenced, and something like half a million quite big genetic variations were identified, in terms of the position of genes. It is against that background that this definition is pitched. That is where we have to take account of the variation. You cannot say now that one particular fragment of DNA is going to produce any particular risk.

Daniel Zeichner: Thank you. I will leave it there for the moment.

Q50 Deidre Brock: The Scottish and Welsh Governments have clearly stated their intention at present for precision bred organisms to be regulated as GMOs. How will ACRE's advice on releases to the environment take account of the fact that the Welsh and Scottish Governments currently have a different approach from Westminster on this?

Professor Dunwell: Well, we realise that the jurisdiction is different. We have observers at ACRE meetings from the devolved authorities—not at every meeting, but they are clearly invited to attend, and some of them do. They can add their own input into the discussions, even though it will not apply within their jurisdiction. Then of course we have the fact that much of the good science goes on at the James Hutton Institute, the Roslin Institute and elsewhere. Those are world-class

centres of science doing this type of research. I am sure that among those scientists there is an intrinsic frustration about the political environment that exists, but I am not going to comment on the policy at that level. ACRE as a committee had sessions in Edinburgh some three or four years ago, and we have spoken to the relevant committees directly. I was part of those discussions.

Q51 Deidre Brock: Is there a counterpart for ACRE in the EU Commission that you have regular dealings with? Obviously, the devolved Governments—certainly, the Scottish Government—are waiting to hear the outcome of the consultation that the EU is undertaking on this area. Can you tell us a little about how that is working currently?

Professor Dunwell: Under the EU system a lot of the discussion was part of EFSA. Obviously it is different now, but in those days it fed back information to ACRE. Even though we have kind of split, we still take account of and look at the EFSA reports on a regular basis. We keep up to date with the discussions in the whole area of science looking forward, because it is our responsibility to make sure that ACRE is not just an isolated UK silo. We have those reports and there still are UK people who sit on EFSA committees, even though we are not part of the official system. It has not disqualified the scientific input from the UK into the EU, which is an interesting element in its own right.

Q52 Deidre Brock: Yes, indeed. I am glad to hear we are not completely cut off. That is great. Getting back to genetically engineered crops, some say that when they are grown on a commercial scale, the risks of escape and contamination are greater. Is that something that you agree with?

Professor Dunwell: Well, it is the terminology "escape". Perhaps it comes from releasing things into the environment, which has some implication to it, but there is no evidence that any existing genetically modified things that are on the market have any greater impact on the environment either through pollen dispersal or propagule dispersal than any existing variety has. Just because it is genetically modified or, in the future, gene edited, it will not intrinsically expand the danger of gene contamination, which is often an objection.

Q53 Deidre Brock: So the fact that these are expanded and grown on a commercial level will not have—

Professor Dunwell: It is not relevant. There is no evidence for that.

Q54 Deidre Brock: Okay, thank you. Can you tell me a little bit about the old-style GMOs and whether all of them would be included in the definition of a precision bred organism?

Professor Dunwell: No, they would be excluded. You have taken a gene or genes, and you accumulate the numbers of genes. Some of the things that are being grown in the States now might have eight or 10 transgenes —separate genes—all inserted into the same variety. That is completely different from what we are discussing today, which is minor changes that are much more equivalent to forms of mutation that have existed for ever. The domestication of crops relied on mutations, but we did not know at the time what they were. Agriculture and what you eat today is a product of natural mutation.

Q55 Deidre Brock: Forgive me, but could you expand a little on what you said about the US and the insertion of seven different—sorry, I am not a scientist.

Professor Dunwell: There are lots of maize varieties that have been proposed and are grown commercially in the States over large areas. Initially, 20 or so years ago, they just had one or two genes, which were to do with insect resistance or herbicide tolerance, but over time the numbers of genes have been pyramided together, either by introducing them all at once or by crossing together a transgenic plant that has one insert and one that has two, so there are varieties now with six, eight or 10 different genes from different sources in one commercial product.

Q56 Deidre Brock: So that has developed over that 20-year period.

Professor Dunwell: Yes, and it has been done by—

The Chair: Order. May I just say that there are a number of people who wish to speak? If there is time at the end, I will come back to you, Deidre. I call Andrew Bowie.

Q57 Andrew Bowie: Thank you, Mr Stringer, and thank you, Professor Dunwell, for coming today. To follow Ms Brock's question, ACRE's advice is the same across the United Kingdom, no matter which Administration you are speaking to, and your advice is that this is safe and is a sensible way to proceed?

Professor Dunwell: Yes. The science is clearly not different. A plant grown in England or Wales or Ireland or wherever is no different. But there are differences in jurisdiction. Where you have devolved authorities, that element of allowing or not allowing cultivation is a devolved issued.

Andrew Bowie: Yes, and there is a political choice. Thank you.

Q58 Clive Lewis: Professor Dunwell, on gene editing, why, as a scientist, do you believe that the precautionary principle has been resolved and seen through to its conclusion and therefore we can now move forward? I am thinking particularly in reference to some of the information that was provided on the unintended introduction of DNA into various species.

Professor Dunwell: We could debate the precautionary principle for a long time.

Clive Lewis: But you are obviously happy that it has been resolved.

Professor Dunwell: Yes, but the discussions and the recommendations we have had are proportionate to the scientific debates that ACRE takes part in. Under the traditional remit, our major remit is to advise on potential risks of GM to human health and the environment. That is the core of our debate. At the same time, we have to do that in this area of moving scientific expertise. We continually adjust that, but those are the core features in what we are tasked to do. Clearly, more tasks might come out of the Bill. In that area, we have for years had flexibility about elements of those core principles. Yes, we are satisfied that the precautionary principle is not an issue.

Q59 Katherine Fletcher (South Ribble) (Con): Thank you for your time, Professor Dunwell. I am going to cough up that I have a biology undergraduate degree. Listening to some of the questions from Opposition Members, it strikes me that you are in quite an invidious position. You have to describe the messy complexity that is biology—how we evolve and how bits of DNA exist almost in their own right, and that it is humans that say that something is a species or a plant, and so on. We have to try to describe that and codify it into law in a way that allows people to have confidence that they are safe, but also allows for opportunities for scientific innovation, using fewer resources and so on.

This might not be a fair question, but has science ever got to the point where it could effectively give us a legal definition that we could use to erase some of the confusion on the Opposition Front Bench, or is biology itself too complicated?

Professor Dunwell: Biology is not physics—you cannot measure every charge of every atom. The appearance of any plant depends on not just the genes that are in it, but where you grow it.

Katherine Fletcher: On what gets switched on and what does not.

Professor Dunwell: Yes. The so-called genotype-environment interaction is what determines how big the weeds in your garden grow. It depends on whether they are watered, whether they have fertiliser, whether they get mildew on them and so on. The plant itself is a consequence of that interaction.

As you say, that is an extraordinarily difficult thing to put down in words to be subject to legal enforcement. I am not a lawyer; I admire the people who put our advice into this Bill. There may be bits that people can tweak, but it is the job of the lawyer to try to compose something that fits legal standards but is also compatible with the kinds of—

Q60 Katherine Fletcher: But would you say that a lawyer may look at a definition and say it is vague because the very nature of biology is vague? Is that fair? I do not want to put words in your mouth.

Professor Dunwell: I have not spoken to the drafting lawyers, but I imagine they have struggled at times with trying to pin down something that is, as you say, flexible and messy. Biology is something that perhaps does not always fit or meet strict definitions.

Katherine Fletcher: But is entirely natural.

Professor Dunwell: Yes.

Q61 Katherine Fletcher: I want to go back to the idea of environmental release, which the hon. Member for Edinburgh North and Leith talked about. To my mind, that implies something that would not have been there as part of nature. You are releasing something into the environment—a transgenic animal; a plant that has genes from different species in it that would not be there in nature. Is there anything that would come under that definition of "release" that the Bill allows?

Professor Dunwell: Taking one step back, any form of agriculture and any form of domestication and multiplication of a crop in the last 10,000 years has been to put something into the environment that was not there. In the case of maize 10,000 years ago, someone somewhere in Mexico found a unique plant with characteristics that they had never seen before, and he or she—that very bright individual—said, "This has got attributes that I can see are good and I want to keep." That was the beginning of the agricultural system.

Katherine Fletcher: And she—let us make it a she—almost environmentally released it into a field.

Professor Dunwell: Yes. That is the context, and I think it is important just generally that people—well, that is me producing a sermon. That is the context in which we are now working.

Q62 Ruth Jones: I am interested in the environmental release side. Your advice to DEFRA was that "different parameters" should be applied to the environmental release of gene editing micro-organisms because of the increased risk of gene flow. Can you explain that point about gene flow? Does that mean that micro-organisms are outside the remit of the Bill?

Professor Dunwell: That is a whole other area. Science in this area has not been applied in the same way to a micro-organism. Obviously, it has been applied to animals. You talked before about asking the question about gene edited animals. One of the things I should add before I get to the other question is that the best example of that on the market at the moment is gene edited fish in Japan. There are two varieties of fish whose growth rate has been modified through gene editing, which have been on the market—I do not know whether successfully commercially, but they are one of the prime examples of that.

On micro-organisms, we hope at the next ACRE meeting—we have not had an in-person meeting since covid started—to start to explore the applications in the microbiology area. We have invited people along from outside, as we do quite regularly, for consciousness raising at a scientific level, to get the best experts to say where they see this type of technology going. Microbiology at the moment is not specifically described in here. It will develop over time because there is an increasing interest in applying different microbes—often ones that have been selected, because the soil is full of tens of thousands of microbes, and some of them are good and some are bad. Many companies now have huge collections of hundreds of thousands of microbes that they go through to try to pick ones that may have an antagonistic effect on other microbes, so they can be applied as inoculants into the soil to improve soil health.

All that is really admirable and exciting stuff. It depends, again, on our ability to identify, extract and sequence genetic information. I went to a meeting probably 20 years ago in Paris, when somebody for the first time said that their PhD student, having spent three years, had got the sequence of one bacterium. He was so proud of that student. Now, you can probably do hundreds in a day. The rate of change is orders of magnitude just in 20 years. It is in what grows out of that and how we develop the regulatory boundaries that the challenges lie.

Ruth Jones: Thank you very much; that is very helpful.

The Chair: That brings to a conclusion this morning's session. Professor Dunwell, thank you for your time and evidence.

Ordered, That further consideration be now adjourned. *—(Jo Churchill.)*

11.24 am

Adjourned till this day at Two o'clock.