

Interview Transcript #1 – vegetable grower in Northern Ireland

October 2018

00:00

...Introductory small talk and project description...

2:17:

I: I would like to record this call because it makes it easier for me to process the information you provide. Would that be ok with you?

P: That's fine, yeah, that's ok.

I: You're also happy for us to use the information in an anonymised form like we described in the information sheet?

P: Yes.

I: Good, thank you. To start off, would you be able to talk a little bit about what kinds of fruit and vegetables you work with, who you sell them to and who you supply from?

P: Ok, we grow around about 170 acres of vegetables here *[location details]* which gives us a temperate climate, in the winter we would very seldom get frost. And we are almost surrounded by water and *[location details]*. We specialise in alley crops, leeks and spring onions. We've got all our herb pick crops like parsley, celery. We grow a small amount of some organic produce. Some brassicas, some leaks organically and some organic potatoes. And we sell primarily to supermarkets and processors as well. Mainly because that's the only real blackmarket that's left in Northern Ireland. Well not only in Northern Ireland but the whole of the UK, I would say. Lots of corner shops type fruit and veg shops are more or less gone unfortunately, but so that's really the history of the business. We employ about 20-25 people all year around. So this business we've started ourselves 25 years before. I didn't come from farmers stock so that was quite unusual at the time. So that's about it.

I: Do you also do direct sales on a farmer's markets or something like that?

P: No, we don't actually. We used to have a farm shop at the farm, but we just had to make a decision at one stage a while ago and kept going with selling produce to each of the supermarkets. We would grow a bigger range of produce and sell at the farm shop. At that stage we decided that we would grow less, a smaller range of crops, and sell it to the supermarkets. And to be honest, I thought it was probably the right decision at the time.

5:18

I: Do you plant everything from scratch or do you buy from nurseries as well?

P: We try to grow all the produce ourselves either by plant or seed directly. For some kinds if we get a little short of produce we might have to buy produce in just to fulfil orders. But we like to try and grow 80 or 85 percent of what we sell.

I: Ok. And which other businesses who work with fruit and vegetables would you say affect your farm the most?

P: Sorry I didn't hear the last bit.

I: Which other businesses who work with fruit and vegetables would you say affect your farm the most?

P: Which other businesses affect our farm?

I: Yes.

P: What do you mean, do you mean like businesses who are doing the same as we do?

I: Yeah, or as you've said, supermarkets or who you can sell the produce to, or farmers in other places that export to the UK?

P: Yeah, we don't export anything. All that we grow is used here in Northern Ireland. I think the export situation for us would be quite difficult because southern states of Ireland would be our natural quickest export because you can just drive, there's just a land border. So, it would be, but southern Ireland are very, very keen at having their own producers and they're very, very heavily marketed and they can look after their own producers which is fair enough. But they would look after their own producers. If they're really stuck they will buy produce from anywhere else. So, to go back to the supermarkets that we did – Tesco, Marks and Spencer's, and Spar, Super Value, that sort of thing.

I: Would you say they can quite heavily decide what they want to buy from you or can you decide on your prices, are you independent in that?

7:47

P: No, we're very much not independent. You sort of take what you're given in many ways but having said that we tend to be able to get a fairly decent price. Most of the time we can't get a better price anywhere else, so I suppose it's the top market price we would get. This year some people haven't gotten any reasonable price but some of the vegetable people here in Northern Ireland got a slight raise in price because of the very dry summer that we had. So, some crops were quite late in places and some people have gotten a raise in prices. But our crops are actually quite good, so I haven't been looking for an increased price.

8:30

I: Ok, that's good to hear. So, what would you consider to be the main water risks that affect you if there are any?

P: I suppose that's one thing that I would say we have in Northern Ireland generally is a less of a risk water wise say that people in Lincolnshire or East Anglia would have. We very, very seldom have to irrigate crops, very seldom. Well this year we irrigated some crops because we had six weeks or seven weeks without rain. But Ireland generally and Northern Ireland especially has been calling water as the least of our problems to be honest. It's an asset that we have to be honest. Going forward if things change, global warming and the rest, drier summers and milder winters or whatever could be. I would have said Northern Ireland as a whole we are in a fairly good position because we get quite a lot of rain, we get rain in similar inches every year. We would actually be a dry area in Northern Ireland, *[location details]*. We generally get enough. We haven't irrigated, just to give you an idea, we haven't irrigated crops in 14 years. Until last year. If we were on the East Coast of England or the East Coast of Scotland even we would be expected to irrigate some crops every year.

I: Do you have problems with floods at all?

P: No, not really. We don't have a valley, so floods aren't a problem, no.

10:30

I: Has this dry summer now changed your thinking a little bit about whether you should be thinking about irrigation practices in the future?

P: It's hard actually, we've bought a little irrigation rail this summer because we had access to water where we've had some of our crops. So, we've bought a little second-hand irrigation rail. So, we set ourselves up in a very moderate way, not spending a whole lot of money. So yes, we would be set up now to do a little bit of irrigation, but I mean the view on it will be

that we might not irrigate at all for another 14 years. We don't know. Nobody knows that. But it's not something high end on my list of priorities. There's a lot of things that would be higher for us. In other parts of the UK that's one of their main problems, access to water.

11:33

I: Regarding the timeframe that you plan for water management or other management things on your farm, you're talking about 14 years, or how long do you plan into the future?

P: Well, I would say that we won't do anything unless we see this trend really dramatically changing. We won't do anything. It would be a silly thing for us to do after 14 years of doing nothing. Change our whole regime because we had to irrigate a bit this year. Because as I say you might get another 14 years when you don't have to. So, I don't have any immediate plan to change our water plans in the future.

I: Other things in your farm, I don't know if you do infrastructure investments or have new buildings or think about what you're going to plant, how much in advance do you think about these things?

P: Well we would be planning a fairly major project every two to three years. At the moment we're putting in a new cool room for storage of harvested products. So, we're just building that today as a matter of fact as I speak. So, this will be our project for this year and next year and then we'll look at something else, I don't know what that will be yet. But I like to have a fairly major project every two to three years. But it wouldn't necessarily have to do with water stress, it would be for the production of vegetables that we produce.

13:17

I: Are you happy with that or would you prefer to be able to plan more long-term?

P: I'm happy with that because the nature of the vegetable industry is that we don't have any long-term contracts with supermarkets. We have sold vegetables to Tesco for instance for over 20 years. But we never ever had a contract with them. I would believe it would be fair with us if they decided "look in two or three years we want to buy leeks or spring onions from you". I think we would come clean and say "look we're changing plans here, in two or three years' time, we won't be buying any produce from you". I think it would be fairly good to be honest. But on the other hand, they don't actually say "look you will be supplying us for ten years, here's a contract". It's something that just doesn't happen. And I don't think that's unique to the vegetable industry. I think that's probably right, going probably in every industry to be honest.

I: But for you it would be better if you had long term contracts?

P: It would, it would be better. But I think it's unrealistic. I don't think supermarkets will more or less ever do that. I think we're as close as we would want to be because there's a big pressure in Northern Ireland. Northern Ireland is trying to increase its own sales and we are producers on these lands in Northern Ireland and we would have to change the whole type, they would have to bring in cheaper lands or less regulated lands in other parts of Europe or something like that. To really stop taking produce of us. I don't think that's happening at the moment I think we consider the essence of that as quite stable.

15:11

I: Ok. Hypothetically, if in the future you had more water-related risks, say more droughts or more floods, or anything like that, or different access to irrigation water, what would you change in the short-term or long-term?

P: Well I suppose if we had to change our plans going forward, we would probably invest in some sort of water storage or maybe trying store a bit of water over the winter time or we got a couple of bore rails, and we could get a couple more bore rails, get some winter water, and something like that. But I say that would probably be a longer-time plan, which I'm also not saying it's not a long-time plan in some ways, but there's not enough evidence to do a lot of investment on it.

I: How would you feel about changing towards planting less water-intensive vegetables?

P: Yeah, that would be good. Useful. I don't know how to do that at all. But if there's any suggestions - I would be open to suggestions for that.

I: In general, are you pretty flexible with the core business that you have?

P: Yeah, absolutely. That's one of the strengths of our business, we are very flexible. We can change on a very short notice.

16:51

I: Good. A lot of these questions are kind of targeted at people who do face water risks, so they don't apply to you...

P: I actually thought that when I saw your email because as I say if you were to ask someone in East Anglia or on the East Coast "what are your ten biggest problems in growing vegetables?", I would say water would come up quite high on their list. Whereas here water would come probably at the tenth on my list, it wouldn't be high on my list of priorities at all.

I: Yeah, but it's good to get this perspective as well because...

P: I don't think it would come as a surprise to anyone reading your report that people in Northern Ireland doesn't have as big of a water threat as people in East Anglia, it would be a bit strange to say it was the same here as there. I think it will be very sensible to record that difference.

I: Yes, ok. Talking about the fruit and vegetable supply system as a whole, getting out of your farm a little bit, what do you think could be changed to also increase other farmer's resilience to water risks?

P: I suppose it's not something we have thought about because it's not such a big threat here, it's not something I wouldn't have thought about so much over here. I suppose you could start planting crops on black plastic or something like that, that would stop the evaporation of water from the ground...but we're a long way from that here in Northern Ireland as I say. But really some plant their plants on plastic or some sort of a membrane so you would have less evaporation from the soil or something like that.

I: And how is the access to water managed in Northern Ireland? The water policies? Are you fairly happy with those? If you needed to irrigate, would you have enough water, or should that be changed in the future?

P: At the moment I don't know. We're not as heavily regulated, because, I suppose because of the amount of water we have. We wouldn't normally be as heavily regulated as it would be on the mainland, because it's such a big issue for them. But we wouldn't be using water off the ground, off the mains as such. We would be using water from the boreholes or rivers or what have you got. But generally, we wouldn't be as heavily regulated as they would be in England.

I: Alright. Do you think any other farmers in your area would have a different view to you?

P: I doubt it. I doubt it very much honestly because everybody has done a little bit of irrigation this year. But again, it's the same story. People don't irrigate unless they have to. Because it's quite expensive and it's a lot of work. So if we can get the water coming from the sky, it seems a lot of money and a lot of work. So, I suppose generally people don't put that much effort or

thought into it because they can go without it and I suppose from a business point of view that's a good thing.

I: Ok, sounds good. So, we're already done with my questions. I don't know if you had anything else on your mind?

P: No, that's fine. I mean I read through your brief and I mean I knew that my story would be slightly different than those of other people because we don't really have a threat. But again, we go through with it because it gives you a broader chance of what's happening in the UK.

I: Yeah, that's true. Thanks so much for sharing this with me.

P: That's absolutely no problem. You can come back to me, keep this number if there's something else later on. If you listen to this recording and there's anything that's not clear, ring me at any time. And I'll ring you back if I can. Is that alright?

I: Yes, that's perfect! Thanks a lot. Bye!

Interview Transcript #2 –Nursery Farmer in East England

October 2018

0:00

Introductory small talk and project description

Consent to record.

Consent to use of information.

3:20

I: To start off, would you be able to give a little bit of information about what kinds of fruit and vegetables you work with and what your company does?

P: Ok, alright. We've got glass houses, at the moment 6 acres. We produce vegetable transplants in the main. Some of them in boxes, some of them in modules, some of them in cubes. Half of them are organic, and half of them are conventional. We produce about a million tomato plants and about 14 million other vegetable plants.

I: Which other businesses do you work most with? Who do you sell to, who do you buy from?

P: We sell to other glasshouse companies and outdoor vegetable producers. So, half of our plants go into glasshouses, tunnels and that kind of stuff and the other half will go outside on outdoor land planting. I don't export anything.

I: Do you grow the seeds yourself or do you buy them from someone else?

P: The seeds I buy everything in.

I: So you don't produce seeds.

P: No, I don't produce seeds, I'm not a seeds producer.

5:40

I: Would you say you're fairly dependent on the needs of the people who buy from you or can you decide yourself what you're going to be growing?

P: 98% of it is grown to order.

I: So that means that you decide on the supply?

P: No. I take an order. And they say I want that variety, in that particular growing medium, in that particular module and I want them on that day. And then I go and do it.

I: How far in advance do people place those kinds of orders?

P: Any time. They might put their order in for the year now, or they ring off, there's a lot of people who ring "can you do this", "can you do that" on short notice.

I: So, it's fairly flexible as well.

P: Yeah. We have to. I mean we like people who are organised because people who are organised usually pay money. They're not only organised in their ordering, they're organised in their business and they do better. You can't help it if you lose a crop in a field and want to replace it with something else and want to be served quickly. We have to cater for all sorts.

I: What are the main water risks that you're dealing with?

P: At the moment I don't have any problems with water. I get it from a bore hole in the ground and only once in the time I've been here it started slowing down.

I: For how long have you been there?

P: 39 years.

I: That's a long time.

P: Yeah.

I: So you generally have enough water access?

P: Yeah. This year was particularly demanding on the water supply. But I didn't have any trouble. The last one must have been probably 20 years ago, and it was difficult. So, what I did was change the way I watered things because I was being a bit wasteful. So, we're now on gantry irrigation as supposed to spear line irrigation and I think that has made a difference. But this year we've had a wet winter and a dry summer, so the aquifers would be quite full. So I'm not sure what will happen if we have a dry winter and a hot summer next year.

I: Are you planning for something like that?

P: Not really, no. I'm not doing anything.

I: Do you also have a water reservoir?

P: No, we don't. If we were collecting...it worries me about the water reservoirs, not the hell, but the thing is I'm in a larger farming area. And farmers are not that careful when they're spraying herbicides. And if that lands on the roof of the greenhouse and the water.. if you were collecting for a reservoir you take the roof water and put it in the reservoir and if it had a certain amount of herbicide in it, that would mess me up big time. So it worries me. You can organise it so that the first 20 minutes of water that comes off your roof goes into the dyke and the rest goes into the reservoir, but no. I haven't found the need to do anything like that yet because I've got enough water underneath.

11:14:

I: What other alternatives would you be considering if you needed to get more water?

P: That would be the first on the list. Recycling I would get very worried about because here I need to collect it all, but there's a chance that you spread the disease from one little bit to the whole of your nursery if there's a disease anywhere. So not that keen on that. And after that, well, I can't think of anything else.

I: Have you been affected by floods at all?

P: No, because it's flat out here. This is a flat area. It's very well drained, diked, and I just happen to be 25 feet above sea level and everything else around me is on sea level. So even if I get a little bit wet it will all disappear.

I: Is there regulation about how much water you can extract from the aquifer and how much water other farmers can take?

P: From my aquifer I'm supposed to take a number of cubic meters, I've got a license for that. I have no idea what happens if I go over.

I: So that's managed pretty well you would say?

P: I don't manage it at all, I just use it.

I: I mean by the regulators?

P: Look at it this way. I grow plants in very small modules. They are 3 cm by 3 cm. And I get enough water into them to last a day. By the end of the second day they will all be dead. Right? So, I have no option but to put water on them. If someone comes along and says "sorry mate, you've got to switch the tap off", then I say "yeah ok, mate", and wait until he goes out and switch it on again. Because I would be bankrupt if I didn't water. They would have to put me inside. I'm not normally like this but that's a really critical part of my business. The chance of killing everybody's plants off or cheating a little bit. Cheating a bit wins.

I: For how long do you plan in advance? Is there a timeframe for how long you will have access to the aquifer?

P: I've got to reapply for my licence every 5 years.

I: Do you plan for any longer than that?

P: You can't. It's how long they let you. Every 5 years you have to reapply for your licence.

I: And with other practices on your farm, building greenhouses or other types of infrastructure, what kinds of timeframes do you plan for?

P: Well if you're building a greenhouse, you're generally planning for a 20-year period. But I'm 64 now. But I tend to look at things over 3 years, possibly 5 years. So, for example the last boiler I put in, I did it over 5 years. But I am building a greenhouse and we'll do that over 5 years, and they last 20 years.

I: So, you're able to plan as far into the future as you would want to?

P: Yeah, the water is restricted at the moment, but ...

I: Are there any other factors that could help you plan better and be more resilient?

P: Yeah, the political situation might be quite useful.

I: Do you think you'll have a lot of labour issues with Brexit?

P: Personally, it's getting interesting. We're lucky. You see, we've got a greenhouse which we heat in the winter and grow tomato plants. And a choice between picking cabbages in the cold and wet or working in a nice 20° greenhouse crafting tomatoes sitting on your bum, I know which one wins. But I am getting scared.

I: But you think that people will prefer to work for you when they have the option?

P: I think they would prefer to work for me as long as the wages are the same. That's a gamble, isn't it.

I: Yeah, you never know what you're going to be able to pay and how prices develop.

P: Well I do know that if everybody else is paying it and I'm paying it and I've got to compete, I should be alright. I just got to watch what's going on. that's all.

18:05

I: If the water situation in a hypothetical future got worse than what you have planned for, say if the aquifer runs out of water or if it gets really dry, how would you adapt your core business?

P: I'm sorry but I would put a 1.5 inch main into the tank, because I've got 1.5-inch mains water. I just put that into the tank and switch it on. That would piss everybody off down the road because the pressure would go down. Basically, I'd have to pay for mains water, that would be the first thing I'd do. And if I couldn't get it out the mains, and couldn't get it out the bore hole, I'd build a reservoir, collecting off of the roof I suppose. Don't have a lot of spare land so don't have many places to put it. I'd have to grow less plants.

I: Would you be able to switch to plants that need less water?

P: None of them need less water. They all need water. And I can't say.. if one plant needs 10% less than another plant, that's just pissing in the wind, as in I still got to water them every day. You can only grow less plants, and that's not good for anybody.

20:15

I: If we think about the fruit and vegetable supply system on a larger scale, do you have any ideas about what could be done to increase the resilience to water risks of yourself and other farmers as well?

P: No, cause I'm not an outdoor grower. They restrict water access quite often around here. I've seen that sometimes you can irrigate at night but not during the day, or you've got this many litres....the farmers are more likely to build reservoirs. It's about reservoirs I'm sure. If I was a farmer I'd have irrigation and a reservoir, a big one, and fill it up in the winter when there's plenty of water and use it in the summer.

I: And is that what most farmers do in the area?

P: I don't really know. I know my biggest customer has three big head reservoirs. And someone will get it out of dykes, someone will get it out of bore holes, get it out of drains. Because everything drains in this area from the midlands, all the rivers come this way. So, you know, pinch a bit out of water, the dykes, the dykes as in the big drains. There's quite a lot of water channels around here, it's just that the water boards control it.

I: Are there a lot of arguments about the regulations?

P: I don't hear them if there are.

I: Is there anything about water management and regulation on the bigger scale that you think shouldn't be changed?

P: Don't really get involved in much of the politics on it, so I can't really say. But I'm sure there is. I mean let's face it, there's plenty of water drops in England, so we just got to collect a bit more of it. It's just not worth enough money. When it's worth a bit more money they'll collect more. As in when it gets a bit more short, they will be a bit more sparing with it and a bit more clever with it. I don't know.

I: So, you think there's still a lot of leeway in managing this?

P: Of course there is. Go to Spain and find out about water management, see how dry it is there. How hot it is. And then you look at England. It's green! We're blessed with a wet lovely climate. And if it doesn't rain for six weeks, everybody gets horrified. Go into Spain you probably got to put off with twice as much evaporation and half as much rain, and they manage.

I: Have you been thinking about Brexit and the ways in which trading with Spain and other producing countries will affect your business?

P: If I knew what Brexit was going to be like, I'd respond. I will just say that it's a choice of which foot you want to shoot yourself in, and that about sums it up. We shouldn't be leaving Europe, we've just been fed a bunch of lies and mistruths, you know.

26:50

I: So, I'm done with the questions that I had. I don't know if you had anything else on your mind regarding how water management influences the fruit and vegetable supply in the UK?

P: Well basically if we don't have it, we don't do a good job. We just can't predict the climate. You know if we knew it was not going to rain for six weeks, we would do something about it. But we've had a continuous supply of rain so nobody, no one gets too carried away. But if we knew better off...restricting people's supply and telling them beforehand. So then they got the choice of whether they put the crops in and gamble or if they don't put the crops in. Or put less crops in and manage them well with the water they've got. But if you want my opinion, I think in twenty years' time, we will be exporting water onto the continent. Because they will be a lot drier than we are.

I: Alright, then I think that's about it for now.

P: Ok.

I: If you get a chance to send back the consent form, that would be great.

P: So I have to sign it? Ok, I'll send it back.

I: Thanks a lot, bye!

Interview Transcript #3 –Large chilled food manufacturing company focused on sandwiches and salads

October 2018

0:00

I: Thanks for taking the time to talk to me so early in the week.

P: No problem. I'm aware of sort of the general project area. Is this part of the same work that John Ingram is involved in?

I: Yeah. John Ingram is one of the leaders of the overall project which this work is part of. Have you worked with him previously?

P: I met him because I serve as *[position]* and John has presented to that group before and also through *[group]* and various forums I've come across John. And I'm aware of the project and other things that are funded as part of the Global Food Security Programme and this one particularly on water. It's actually interesting because it's an area I'm aware we need to do more about as *[organisation]*, as a company, so it's an area I'm keen to learn more about – what you're doing and what you're looking at, and of course answer the questions of the formal interview.

I: *[Project explanation]*

P: That's brilliant. So, it's quite comprehensive but you're starting with fresh fruit and veg? Interesting.

I: Yes, because they use a lot of water and water-risks involved along the supply chain of fresh fruit and vegetables.

More introductory small talk.

4:49

I: Should we walk through the questions that I have and then talk about anything you would like to add?

P: Sure, I mean if there's anything that comes out from the questions that we want to explore in more detail, that will be good. We can talk about that later on, but one of the things that I'm interested in is whether there's any sort of working groups that you're aware of, whether industry or just academia alone, or both combined, that are addressing this area and that we could potentially feed into or that we could link up with.

I: Yeah, that would be great. You've already said that you're involved with a couple of working groups already with John. You know, this hopefully will feed into policy, hopefully more working groups will be established as a result.

P: Yeah, what will be the outputs of the project you think?

I: *[Explanation of project outputs and communication strategy]*.

6:50

I: You're happy with me recording the call so I can transcribe more easily later on?

P: Yeah sure.

I: It's going to be deleted and anonymised so you won't have to worry about these kinds of things.

P: Great, thank you.

I: So, to start, would you be able to talk a little bit about how *[organisation anonymised]* interacts with fresh fruit and vegetables and what you use them for mainly?

P: Yep. *[organisation]* is a manufacturer of predominantly chilled food products. One of our main products is sandwiches. I guess just over half the business is sandwiches, sushi, wraps. We do some prepared salads. So, within those we use an awful lot of fresh vegetables and salads. We also have a prepared meals business with chilled ready meals and so we would also use quite a lot of vegetables going into that as well. There, we tend to use processed frozen vegetables quite a bit but there we can also use produce for things like garnishes, so we would also use fresh produce and fresh vegetables in that strain as well. We have ambient sources and pickling operations as well. Within the ambient sources we would be using predominantly frozen sources, but in the pickling business we would be using fresh onion and beetroot, cabbage and obviously preserving those, so it's huge for us, produce and vegetables.

I: Obviously for the salads you buy everything fresh, but do you also buy frozen produce or do you mainly use fresh?

P: For salads it would mainly need to be fresh. For us everything has to be prepared as ready to eat. So, from a food safety perspective you obviously can't just use frozen that's not been prepared for that purpose. So predominantly what's going into our salads, sandwiches and wraps is going to be fresh vegetables and produce.

I: And for the ready meals as well?

P: For the ready meals it sort of depends. If we're preparing a sauce, we're doing a lot of Italian style ready meals. So, if we're preparing a sauce, we put a lot of vegetables in. They would probably be preserved so a lot of tomato would be canned, and also frozen vegetables would go into that as a cooked source. But if you're adding garnish, that garnish would likely be fresh. So that would be from a different strain, that would have to be fresh, ready to eat.

10:35

I: And so which other businesses that also work with fresh fruit and vegetables do you interact most with?

P: Well, on the customer end, we are an own label manufacturer, so all of these products are for the major UK retailers, so we are putting them into packs which let's say Sainsburys or Asda or Morrisons on the label. So, whoever that customer is, that's at that end. On the supplying side we have over 500 raw material and ingredient suppliers. Not all of those are vegetables, that's going to be the whole of our ingredient range, however a lot of those will be vegetables. Because it's such a major part of our business.

I: Which ones of those businesses would you say affect your business most in terms of determining what you can be doing?

P: Well, I couldn't say which ones affect us most because we have so many that if we have issues with the supply chain in any of them it's likely to cause a problem. For our produce we don't just rely on one or two suppliers, we spread the risk, so we have a variety of suppliers. However, if you give the example of the moment, because of the weather in the UK and Europe over the summer, we are in shortage now of a number of vegetables. For example, things like onions, cabbage, the quality of some vegetables is very, very low. And that's causing a challenge for some of our products and therefore we are having to look further afield for our sources. We will be able to source them but some of our normal suppliers we would rely on are unable to provide us with the products that we need at this time because of the weather. So, I'd say they're all pretty important. I guess what we could say is that some or quite a few of our suppliers are agents. They are not growing things and then directly supplying us, they are an agent who buys in from a number of different producers

and suppliers. So a number of farms that they're sourcing from. They would supply us then. So in that way we are already sort of spreading risk as much as we're not relying on a farm in one particular location to send us a product.

13:51

I: And on the customer side? Are you fairly diversified as well? Say if Tesco were your main customer, could they dictate a lot about what and how you will be producing?

P: No, we have quite a number of customers and produce different things for each of those. And of the things that we supply into our customers, generally they don't dictate. There's one customer that for certain products they would dictate the supplier or would give you a limited range of suppliers, but generally they don't.

[Call cuts out out]

P: Hi you're back. I lost you momentarily there. Was just trying to type you a message.

I: Sorry I had a connection problem.....lost you when you were talking about when you were supplying different products to the customers.

P: So we do have a customer that would dictate some suppliers so you would have to get it from a particular list. There's also restrictions for countries of sourcing for some of the customers as well. But also with each, the customers will have all the technologies looking at a different area and they will be aware of the suppliers for the ingredients for their products. If we want to change that, to add another supplier, we will generally have to make them aware of that. So it has implications, it's not as straightforward as saying oh we will swap to that one or to that one. At the moment we have a few suppliers that we would normally use for a particular ingredient and if we have to go outside of those, which we have to do at the moment, we will have to make the customer aware of it. It's a bit of work to do that.

17:50

I: In terms of water specifically, what do you consider to be the main risks that affect you?

P: You mean generally, or around water?

I: Around water and water used for fruit and vegetables specifically.

P: Well, I guess there's a couple of things there. So just looking at our own operations, we have a number of factories which are in areas which are at risk, I guess, of water shortage. We have a salad factory and a ready meal factory that are in the East of England. So *[location]*, and *[location]*, and we consider these areas at risk of being in water shortage. And then we have *[number of]* sandwich factories in the South East and again those are at risk of water shortage. So where that will impact us is that each of these factories will have their own prep and washing operations going on for incoming produce. They are also, we have major hygiene requirements as you can imagine being chilled factories. Microbiological control is absolutely paramount. So, we would be using lots of water in our hygiene, for wash downs. We make quite a variety of products and at the end of each line you're looking at doing hygiene runs. Whether those are major or light cleans that would all involve water. So that's a risk, but also doing things like boiling pasta, whether that would be for salads or prepared meals, we are using quite a lot of water there. So, within our own operations, and that's just factories that means to say we consider that an area of water shortage. That's not to say that other areas in the country wouldn't also be affected by that and we have *[a number of]* manufacturing sites within the UK. Then from the produce supply side, we

recognise the risk on a number of fronts. We have the risk where you got too little water, something that we've had this year. So, I mentioned we got a shortage of vegetables supply going into a number of factories, where we are literally looking at things running completely out, for example onions. The other issue is that with the opposite of that where you got too much water. So, flooding likewise can cause issues, so when the vegetables can't be planted early in the year because of flooding, or the harvests are disrupted due to flooding that can also cause shortage. The other risk there is microbiological, because where you've got floods there's increased risk of micro-problems. Because then the micro levels are too high, and we cannot allow those ingredients into the factory. Then we have a problem there as well which can cause shortages. So, water is major for us I think is fair to say.

21:44

I: Have these risks converted into actual problems in the past or are you just aware of the possibility?

P: Yeah, we do see problems with water-related shortages. As I've described, and not necessarily in the UK because we cannot only source from the UK - we would also source from Europe and from further afield. So, whether you're talking about frozen, or you're talking about fresh, you know that we are limited on how far afield we can source to the extent that we are looking out. Within our sandwiches, for example, we use so much leaf and also fresh herbs. For one factory we've got a partnership with a hydroponic operation. So obviously that reduces the amount of water used to grow that leaf. We are also planning to cooperate with other suppliers for more hydroponically grown leaves and herbs and where those are also grown in conditions that are microbiologically safe as well so that we cut down on the amount of washing that is required. So we're reducing the amount of water in two stages within that production.

I: Great, and within the experiences that you've made this summer, are you planning to change anything in the future, for example in sourcing cabbage or onions?

P: I think the result will probably be that we will have a wider range of suppliers with a wider range of sourcing countries on there. That's about the only thing we can do at the moment. For some of those we've got the sort of the hydroponics option, but that's for a limited amount of products. We can't do that at the moment with things like cabbage, beetroot, onions, we can only look at how further afield we need to source, so add a bigger range of sourcing countries to our supplier list.

I: In terms of the other risks that you mentioned, how do you plan for them, like water supply in the factories?

P: Well, that's where we're just starting really to scope that out. At the moment we don't have any plans, but I think we're vulnerable and I would like to understand more about the management schemes or the potential for water management in those areas that will make us less vulnerable to water shortage. But at the moment I feel like this is an area that is a risk to us and we need to have more of a ready solution for that. But that, I think, involves working and partnering more widely with other businesses in the area and with water companies so that we can understand more about that. Say it's an area that, from a group perspective, we're starting to get a handle on the bigger picture. There have been local issues - I mean we managed ok this summer even though there was a shortage of water. But we've had it in the past, for example, flooding has been a major issue. We've had a flood in a factory in [location] a few years ago which resulted in us putting in place improved flood

defences and flood management. So, you know, that was a really acute incident that required some serious action in response. At the moment I think because...

I: Flood defence in terms of infrastructure?

P: Yes, and then also, again we're partnering with the sort of local authorities and environment agencies on that. But then because we haven't yet been hit with any serious issues with water shortage, although we've had a taste that this could be something we will see more of, then we haven't yet got I guess the plans in place that we're going to need in the future and that's something we're looking at.

I: And what do you think makes it especially difficult to come up with these kinds of plans for water management?

P: I don't know what will be especially difficult.

I: Or why haven't you looked at it yet?

P: It's about getting an understanding of what the opportunities are there and how you do manage water in those areas so that you don't run out. I mean the fact that you didn't run out over the summer that we had I think is promising. It shows that there is already some level of management there. But we need to really understand for our operations where our specific vulnerabilities are and what we can put in place to address those.

I: And how far do you currently plan into the future?

P: At the moment most of our, the sort of risks that we look at are at a maximum of 5 years out, but I think in this case we need to look further, 20, 30 and beyond, and I'm trying to understand what sort of scenarios we're looking at for then. Having said that, it is quite difficult to do that. When you're talking on those timescales and wanting to put things in place, particularly when there's any capital investment, then you've got to get the business on board to understand that this is a real risk and to be prepared to make that investment although they may not see a return on it. But for some time to come that's a challenge

I: Are you fairly positive about that or do you think it's going to be really difficult?

P: It's hard to know the sums of money essentially. If it's something that requires us to be a participant in a particular programme, I think that's fairly easy to get buy in for, obviously depending on the commitments there. If it's about capital expenditure now to mitigate something that's going to happen in the future and that we don't necessarily see in the moment - that's a challenge. Because obviously the operational managers are very much focused on the day to day issues.

I: If the water related risks will go beyond what you can plan for or what you have planned for, what do you think would happen in the short term and what would happen in the long term?

P: In the short term I think it's business as usual. We're going into winter now and there's less risk. But what we need to understand is what's the longer-term forecast for particular areas of the business areas. Are we focusing on the right areas, are we missing some? We're always assuming the North West for example isn't going to be short of water, however, that wasn't the case this year. We saw water shortages in the North West. Again, it didn't affect our operations, we worked through that. Longer term all we can do is to outline the risks and give that as a message to management teams within the business and making those recommendations. But what I'm really interested in is getting involved in programmes that are local to sites so that we can start to see some benefits of that and be involved, getting local information, getting facts and figures that will build..

[connection lost again]

32:30

I: I'm back, sorry, there must be some problem with the connection. Please go ahead.

P: I'm interested in getting involved locally. If in any of the areas that we've outlined as high risk, if there are any working groups there...I'm aware that, I think, WRAP have done stuff in this space, I don't know whether they still are but there've been various groups I know. Because I used to work at [organisation] and they've had a water working group that unfortunately stopped meeting a couple of years ago. That's what I'm interested in so that we can join through one of our local sites. Use that maybe as a model, and get some data so that we can really make a robust case. Have a better understanding based on data of what issues we're likely to be faced with.

I: And in the long term, do you think it would be your main objective to maintain your core business or if you were really heavily affected by water issues would you consider shifting towards a core business that uses less water?

P: I don't really see that that's an option. All of our core business – we are a chilled food manufacturer – that's where we see, chilled convenience is very much where we see the future. So, we have to find ways where we manage our water use. So generally, on a regional basis but also within the factory. I think there's a lot more that we can do within our operations. For example, cleaning of the products sort of coming in, and also cleaning of our manufacturing equipment and production halls. How we reduce down our water use there without compromising hygiene in any way, and I think there are solutions coming forward there which we will be looking at in the future. The use of hydroponically grown products in an effectively sterile environment, that's a big move forward. So that we don't have to do any cleaning there. That one would be an example of innovation which would be water saving. We would look at whether we can expand that. But I think, say in terms of our own use of water for clean down, that's where we need to focus, and again I think there are innovations coming through in these areas.

35:32:

I: Ok, good. What kinds of external factors could you think of that limit your capacity of implementing such water management practices?

P: At the moment it's simply understanding how to do that, I think. Getting a better understanding of what water management means and how we affect that. So, until we've dug into that a bit, I don't know what the limiting aspects would be. I need to see what systems need to be put in place in those regions and what is needed to support those. That would be the questions I'd have.

I: And from a regulatory perspective, are there any restrictions you have now in terms of water?

P: The restrictions that we have are not about water coming into the factories, but we need to have consent for the effluent that we produce and where that's discharged and how we manage and clean up the discharges from the factories. It's all on that side from a regulatory perspective. I'm not aware that we've run into any issues with the amount of water that we use, that we draw into a factory.

I: Stepping out of your business specifically, can you think of anything that can be changed on a bigger scale to increase resilience of the fresh fruit and vegetable system?

P: I think suppliers have to start to manage water. Or if they haven't already they need to manage water as a precious resource. So, I think in the areas where they already have water challenges, Spain, Italy, we see some really good practices of managing water so that the

minimum amount is used. I guess that has to become more of the norm. And particularly here within the UK we need to get used to the idea of water being a precious resource that we have to manage very carefully. I'm not sure but I don't think we are in that situation yet. But you see some very good examples. We have a tomato supplier in Northern Italy where the tomatoes just receive the amount of water that they need to grow. And they're very tightly controlled irrigation systems. No run off, no loss of that water and that's what I think we need to look to in the future.

39:30

I: Do you think that's all the responsibility of farmers or should that be regulated centrally by governments or would you as a manufacturing company be able to put out standards that you require?

P: It's probably a little bit of both. We are actually involved in some projects where we are looking at the environmental impacts of our suppliers and trying to influence those. To say ok, what are you currently doing? What is your impact on the environment? How do you mitigate that currently? What are you planning to do better in the future? Just not starting from the single, same starting point effectively. When you look at some suppliers who have been facing these challenges for a longer time and are more advanced, they are already doing this because it is a no brainer for them. They can't put up with supply issues so therefore it's absolutely in their interest to manage it. I can see there being regulations applied in the future and almost quota on water. And it would be in the producer's interest to store water and check that they collect rainwater and run off and these sorts of things. Whether that will be regulated before it becomes good business sense to do, I'm not sure. As a customer of some of these suppliers our influence is diluted the further up the supply chain, or the further distanced we are from them on the supply chain. So, if we're going through agents to source products then we have a limited amount of impact, although we are still trying to talk to suppliers directly to form a relationship with them. But I think it very much has to be in the suppliers' interest to do this, that's what will really drive change.

I: Do you think there's anything within water management practices that should not be changed on a larger scale?

P: I guess where it's being done well. Again, I'd say the need has probably outrun the implementation of regulations. Where leaf suppliers for example will say we switch to hydroponic sources, where it is, you've got much better management of water, less water being used. Then that again will drive innovation, I don't think I would change anything there.

I: Do you think there are other groups of people that will have a different opinion from you?

P: I'm sure there are. I'm looking at it from a perspective of a manufacturer.

I: What do you think they would say?

P: I guess there's plenty at the moment who will say water is not an issue at the moment and there's no need to change anything. But if you're in an area that doesn't suffer from water shortages then you would say that. But the point of water management is that you would spread that availability of water throughout the rest of the country and so I can imagine those people who have plenty and don't have issues wouldn't be happy with having their supply reduced so that others could reduce their risk. I don't know. I'm just guessing really.

43:40

I: So those are the questions that I had. Do you have any other thoughts or comments that you had on your mind?

P: I'd just be interested to know how many producers you're actually talking to in relation to manufacturers, are you speaking to any retailers as well?

I: We're trying to get a comparable number of interviews for each group. But it's been hard to get interviews with retailers because a lot of them say we don't use any water ourselves, we already buy everything washed and processed, so it's not our problem. But from our perspective we think that they should think about it, because even if they don't manage water directly, they depend on good water management practices for their businesses.

P: Absolutely, yeah, when they're not able to put any lettuces on the shelf they will be worried.

I: Do you have any contacts in retail that you could put in touch with from your customer base or any other networks you have?

P: I could think of a couple maybe, I can look at that. Can't give you names but I can let them know about the project and tell them that you're struggling with interviews in retail and maybe get them to talk and put you in touch with them. Let me have a go at that. And then, are you talking to UK based businesses or are you going further afield, I know you're focusing on the global food security for the UK from a UK perspective, but are you also looking at participants based abroad?

I: We are looking at organisations abroad as long as they import fresh fruit and vegetables that will be consumed or processed in the UK.

P: And are there any groups or anybody else that we should talk to as a business? As I've said we're trying to scope this area and trying to understand what our risks are. Are there any groups you're aware of you think we should link up with?

I: I don't know, because I'm fairly new in this area as well. But I'm happy to discuss this with my colleagues and I'll get back to you with any recommendations they might have.

[connection cuts out again]

P: Lost you again there...

I: Yeah, I'm really sorry. Somehow the connection drops every 15 minutes. But anyways we'll be in touch about these points. Thanks again for participating. It was really valuable to get your perspective.

P: Please do send any papers etc my way.

I: Yes, and we'll be in touch about the other points, too.

Interview Transcript #4 – organic fruit and vegetable grower in East and South West England

October 2018

0:30

Introductory small talk

6:00

I: To start off, would you be able to talk a little bit about what kinds of fruit and vegetables you work with and how?

P: Yeah, so basically, we're, I manage our home farm which is mainly vegetables, but we do a small amount of fruit. We got a very small area of plums and some soft fruit, gooseberries and black currants and redcurrants. But the vast majority of our cropping is vegetables. And we do about 140 acres of vegetables each year on our farm in *[location 1 - South West]*. And we do about 90 acres of vegetables on our farm near *[location 2 - farm East]*, our *[farm name 1]*. We also got a very small polytunnel unit near *[location 3]* which is called *[farm name]*. We also run that as well, but the biggest players are really *[farm name 1]* and our farm in *[location 1]*. And they're quite different in terms of set-up and climate and water. Because one is on the east of the country and one on the south west. So just to give you an idea in terms of vegetables in *[location 1 - farm South West]* we're growing, we kind of specialise, we grow 40 different crops and it's just short of 120 different varieties, which is quite a wide range of crops to be doing really. And the reason we're doing that is because we've grown up from essentially a very small vegetable box scheme and that's kind of what stimulated it. Most farmers who grow for supermarkets and packers and so on tend to sort of specialise on 4 to 6 crops or something. So, to be growing 40 is still a huge number really. On our farm in *[location 1 - farm South West]*. We've kind of specialised in growing things like salad leaves, spinach, lettuce, what we call high value perishable crops which quite often require high input of irrigation and high inputs of labour. And it's partly because we're producing, our land base is quite close to our main pack house. So, we can pack the vegetables in the morning and bring them in nice and fresh each day to be put in the boxes and so on. And then we've also got a programme of crops in the winter, which are more things like winter brassicas, cabbages, purple sprouts, broccolis, kales and leaks. That's about 50 acres and they're crops which we normally do without irrigation. And then up in *[location 2 - farm East]*, we're growing, cause it's drier out there, we tend to do 30 of the 90 acres main crop onions, and then we do about 30 acres of brassica, various sort of brassica crops, 30 acres of other vegetables, a whole range of sort of lettuces but it's slightly less diversity up there, we're growing more like 25 to 30 types of different crops up there.

I: And are you overseeing all of these farms?

P: Yeah, that's right. I sort of oversee them and I got my management team. So, I've got a manager that I work with on the ground in *[location 2 - farm East]*, I've got one in *[location 3]* and then I've got 4 people down here. I kind of oversee the department.

I: Ok, so that's quite a big job to have. Do you then use all these vegetables for the vegetable box scheme or do you also have other ways of selling them?

P: They're primarily for the vegetable box scheme. We have a small wholesale outlet as well, so we got a small wholesale department who are selling to sort of other shops and wholesalers and box schemes and so on. But the majority of the vegetables are being grown for our vegetable box scheme and we're doing up to, I'm not exactly sure where we're at numbers but it's basically 45 to 50000 deliveries per week, 45 to 50000 households per

week. So the vegetables, all the programming is done for that in advance and essentially like out of that, so *[employee name]* who does it, he's basically like planning the ingredients of each box type for each week of the year. And then out of that computer programme it spits out the total amount needed. And then it's divided up among the farmers, our suppliers and our own farm. And then we plan, because we can see the demand for each week and we basically work out a plan that will meet the objectives of delivering the vegetables of this week as close as we can, weather permitting. So, what I'm trying to get across is we're completely demanded by our box business basically. And we're not selling to anybody else. We have done in the past. We used to sell a proportion of our vegetables to a supermarket packer but we gave all of that work up a few years ago. So, it's essentially the box market now for us.

I: And you manage all of the box business yourself or do you work with a sub-company for that?

P: No that's part of our company, so our name is *[company name]*. So, we have different departments, but we have two main pack houses that are packing all the boxes into those 50000 households. So, our farm here goes into the pack house here, which is the bigger one. But some of it might travel up to *[location 2 - farm East]* and vice versa. It's really whatever is sensible, whatever is needed and what's sensible.

I: And do you interact with other businesses as well, you said you buy in other produce sometimes?

P: Well yeah you can imagine. When we first started, in *[year]* or something, maybe it was *[year]*. It was some years ago and it literally started with *[founder name]* who is the owner of the business. We were delivering about 50 boxes a week to sort of friends and people that he knew, neighbours in the area. So, there was a period of time when we were growing all the vegetables for the box. And then it became a thing that basically took off and began to expand and went through some incredible growth and we soon realised that the area of land required to feed that, that we couldn't do that from our own farm, that we had to expand the production somehow. It was *[5 years later]* I think when *[founder name]* started the cooperative of farmers called *[name]*. That's *[number]* farmers who sort of formed into a coop. Essentially, they accessed EU grant money, which is money that was available for buying machinery. They grow vegetables for us, dedicated to us. They're a big part of it. In addition to them we also have what we call third party farmers and growers who are people who are organic farmers and growers who we use essentially for things we feel we can't do very well on our farms or cooperative of farmers. So, we have one guy for example who does Brussel Sprouts for us. He's got some lovely land up in an ideal growing area in *[location]* and he grows the sprouts. So, if we think it's sensible to outsource it, and also you can imagine some of the foreign supply. Just because we go all year round. We've got a good network with Spanish farmers for example who grow spinach and lettuce for us in the winter. And then the whole thing like citrus, bananas, that whole kind of thing we can't grow in the UK so we have to bring those in from abroad. That's basically the set up.

16:16

I: Do you work with an agent for those or buy them from wholesalers?

P: Well, a bit of both actually. We've got direct links with foreign suppliers and we also go through agents who we've got very good relationships with who sort of manage the supply. What they always ensure is they know exactly the farms abroad and what they're like and have a good relationship with them and they visit them regularly. Because that means that we can be confident that we are happy with the provenance of it and that it's organic and the

fact that it's produced in a good way. And also, we can tell a story as well. Our customers are interested in those foreign farms as well as our own. We do give quite a lot of information back about the growing and the farming. That's what our customers are interested in.

I: Which other businesses or organisation in the supply chain would you say affect your business the most in terms of who you compete with or who you depend on for supplying all the vegetables?

P: So, well. I don't know - we are fairly unique. I think our biggest competitor is probably *[company name]* which is the other biggest vegetable box scheme who are mainly *[location]* based. But generally speaking, we are in competition with them yes but I mean it's not, I suppose we're really sort of trying to encourage people who buy their basket of vegetables from the supermarket to switch and start to buy their vegetable box. And what we're doing more and more now is that we're offering additional products with that box. We call them extras. So basically, you can buy a vegetable box but you can also buy things like eggs and milk. And you know fruit, biscuits, other groceries with it, wine, there's a whole list of things you can buy as extras with your box. We're moving more towards kind of an online retailing business really but underpinned by our vegetable box offer I suppose. But we're very much going into that. It's about online delivery really, ordering online and then delivering. We had to make some massive changes, we have a very big IT department now. They do work on the website and on apps, so people can use them on their phone to order, it's just kind of the way that the world works now, isn't it? Sort of how people order food. And we're part of that.

19:43

I: So, you also feel like you're an alternative for the online shops of large retailers?

P: Yeah, sort of. Our offer is quite unique because we've decided to go 100% organic. So every product we offer is organic. The reason we did that was to keep it nice and clear for the customer so there wasn't any confusion and also because we're quite passionate about that. But I suppose it was just the idea that there's a huge market of people out there who buy from the supermarket. They probably carry on buying from the supermarket but they sort of decide to buy a proportion of their shopping from us. And one of the benefits of that is that they will find their vegetables are fresh and interesting and there's a whole kind of back-up network of interaction about making growing and eating vegetables more interesting which is kind of what everyone is encouraging people to do these days. For health reasons and for the planet and all those kinds of things. But also just for fun really. We got some tremendous information that you can access on the internet and we got some books, leaflets, newsletters which help people to cook, and get into the old habits of actually cooking. Which has been dying really because people are eating more and more processed foods and take-away. That's fine obviously but you need to also just cook food from good ingredients as well and we're trying to encourage that trend back.

I: I've been using vegetable boxes as well and one of the interesting experiences for me was that it included a range of vegetables which I didn't know before, and so it was a challenge to incorporate those in my recipes. Sometimes, especially in the winter, it was challenging, but I really liked it.

P: Yeah, that's right. There is a bit of a tendency that if you buy your vegetables at the supermarket, you tend to slightly go with the things you're familiar with. It can be quite challenging being a box customer. But I think what you can do, people get savvy with it. You can quite easily have a look around the different boxes that are coming up the next week you are ordering for and you can see what the ingredients are. and you can mix it up a bit.

You can say “ok, I’ll have a big box this week, but next week I’ll maybe get a small box” and also you can see what the ingredients are going to be and you can play around with that as well. At the moment we don’t do what they call a choice box, or an exclusion box. Some box companies offer that. So, for example you actually hate suede, you can exclude that item from the box. We don’t offer that at the moment. But the way you get around it is that you see that the medium box for example doesn’t have suede this week, so you order that. The trend is more and more to order a basket of items that’s more bespoke to the customer and we’ve kind of got ourselves geared up. Mainly our pack house in *[location 1 - farm South West]* to facilitate that in terms of packing. It complicates the packing quite a lot. There’s some quite high-tech stuff that we’ve got now that helps to pack that efficiently and deliver it. We’ve had to manoeuvre ourselves into that position because that’s what people want in a way. But running alongside, there is still the traditional vegetable box which we choose the ingredients of, and there’s still some strong support for that way of doing it as well. So a combination of both really.

24:40

I: Would you be able to talk a little bit more about the water risks and the water management practices that you’re working with at the different farms?

P: The two farms are quite different. So *[name of farm 1]* farm is the farm in *[Location 1 - farm South West]*. *[Farm name 2 - farm East]* farm is the farm in *[location 2 - farm East]*. Down here at *[name of farm 1]* we get, just to put it in context, on average we get 40 inches of rain per year, and at *[farm name 2 - farm East]* we get more like 20 inches. So, we get half the rain at *[location 2 - farm East]*, because it’s the drier part of the country. But the business grew up here, it’s not, how can I describe it, a traditional vegetable growing area. We’re in *[location 1 - farm South West]*, it’s more of a traditional dairy area, growing grass for livestock. But the way things worked out, that *[founder name]* parents took over the tenancy of the *[company name]* farm in the *[decade]* and he ended up setting up the business here. The business started from a very humble business and the farm has grown and the business as well over the *last [number of years]*. So, what’s happened here is because we’ve grown each year if you like, our irrigation infrastructure has grown with it, it’s rather fragmented. It’s quite challenging. Compared to our set up at *[location 2 - farm East]*, which is a farm, we rent that 500 acre farm. When we inherited the tenancy of it already had a huge irrigation reservoir, one reservoir at the corner of the farm and a whole structure of main piping that went to all the fields whereas in *[location 1 - farm South West]* we’ve built up from nothing to having five or six irrigation reservoirs which are connecting up but it’s quite complicated. Our topography makes it difficult, we have quite steep hills so moving water around makes it challenging. Would you like to have more detail about the irrigation water?

27:31

I: Yeah, so what kinds of systems are you using?

P: At *[name farm 1– South West]*, we basically rely on winter fill reservoirs that we constructed ourselves, and we’ve got four main locations. It’s something like six ponds, or irrigation reservoirs but in four locations. And then we’ve also got some access, and sorry those reservoirs are basically winter fill. And they just fill from surface water basically. And then we’ve also got an abstraction license that we can take a bit of summer water out of a broke that feeds into the river *[river name]*, but the vast majority of our water is winter fill. And that’s about 32000 cubic meters of water approximately. And we’ve kind of worked out

that in a dry year, just to put onto the crops, we need about 34000 cubic meters. So we've just about got enough to sort of give the irrigable crops the water they need. But then there's a further requirement for, we've got 4 or 5 acres of polytunnels and they require a further sort of 6000 cubic meters and then we've also got a requirement for weed stimulation. We run a stealth seed bed system, so we make soil beds basically and then we stimulate a weed flush which we then strike off or burn off with a burner. So, if it's dry you need to irrigate that to stimulate the weed and that's another 3 to 5000 cubic meters. So, all of that is adding up that we need about 45000 cubic meters, so we've got a shortfall of about 13000 cubic meters of water. So the thing is, what happens normally is that some summers it's wet so we don't have an issue. It rains enough to reduce the irrigation requirement. Just as a rough sort of guide we've normally got enough water. In a sort of an average normal summer we sort of get a little low in our reservoirs towards the end of August, but we then still got about three or four weeks left of water. And when it starts raining in September any worry is gone and we've got through. In a wet year our irrigation is very low and we don't have to irrigate much at all. But this year was a very bad year and we've run out of water close to the end of July and we had to put in a significantly reduced scheme of irrigation several weeks before that which meant that a lot of crops were suffering because they didn't get the water they needed.

31:23

I: Then what did you do?

P: What happens is that in a dry year, like this year 2018, it is so hot, and the temperatures are so high, that the evapotranspiration is just massive. So, any water that you do put on, half of it is just gone. It disappears off the surface of the soil it is going on to. So you have to actually put more on in order to get some of it go in. So that increases the usage of water, that would be a fact. You know there's no rainfall helping, so all the water that the crops need is going to come from your irrigation. We would irrigate more than normal and using up the water faster and what we had to do then is - think if we carry on like this, we're going to run out of water for all of our crops. So we decided to prioritise the most valuable crops, which for us are the polytunnel crops and the winter salad packs as we call the salad packs. And then things like spinach and lettuce, we just didn't get the water they needed, so that's where we had crop losses and, you know, it became quite bad. And also, we didn't have enough water to stimulate the weed I was telling you about on our stealth weed beds. So that means that when the crops did grow and there finally was rain, all the weed came up at the same time at the crop. So we had very weedy crops going into the autumn unfortunately.

T; Could you buy water in this situation?

P: No, you can't. Water is like, sort of the quantities that you need, are huge really. You can't handle it. If you're a small, a very tiny enterprise then you can probably do it. But you know, we are talking about field scale irrigation. The volumes of water required are so massive, there's nowhere to access it from. This is the thing. With farmers that can access somewhere, extractive rivers and so on, what normally happens is that all the restrictions go on those. So even those farmers are restricted to pull out water from the rivers. Yeah, it becomes very difficult really. What I was going to get at, to make your system more robust, you need to have more capacity for winter fill reservoirs which is what we're considering now. We're seriously considering putting another reservoir in. But you can imagine it requires quite a capital spending and we haven't costed it out yet. But you know, just a 20000 cubic meter reservoir may be 40 or 50 thousand pounds which is a lot of capital

expenditure, it's a lot of money. It's a bit like the old change, the minute you hang the washing out it will start to rain. Can you imagine we invest in all this and it will be wet for the next five years?

I: Yeah, because you don't know what it's going to be like.

P: No, you have no idea. The thing about it though is that, I don't know how much you know about vegetable growing. Have you been to any farms?

I: I've done some small community farming, but not very familiar with large scale vegetable farms.

P: You've got crops growing with things like....you put the water on for t-tape, it's like little flaps tracked in pipes with holes in it, sort of half a meter into those, they put water into the plants' roots. That's a very efficient way it gives you water into the plants, it's in the polytunnel. I think from the dyke you can do it in the field as well, but it's quite a job to set up that structure, and then you get your overhead field irrigation for your field crops and that's where we use most of the water on those crops.

I: Have you been thinking about using hydroponic farming for the leaves and things?

P: No. I mean, we're a member of the Soil Association so you can imagine that wouldn't go down very well. We're kind of aligned to a system that believes in soil as being the most valuable medium to grow crops in. We basically argue that it produces the most tasty and healthiest vegetables and that it's a resource we need to look after. And that's kind of where we're aligned to really rather than anything like hydroponics. So yeah, that's kind of where we are. So, we're trying to, just to finish the capacity thing. Our farm in *[location 2 - farm East]*, has that enormous capacity, it's actually 196000 cubic meter reservoir, so nearly 200000 cubic meters. Just in one big reservoir. You know many years ago the farmers there used to grow conventional potatoes and we've inherited that source and it's been fantastic. Nigel, the manager there, can water all the 90 acres of crops. It's a great set-up there because he's got access to a winter abstraction license there. He can move water - the environment agency allows it to take water from the winter and move it into a storage area for usage in the summer. That's different to the system we've got. Down here it is that we still have to fill essentially from surface water. Our summer abstraction license, we find it a limited help because the brook we can pull the water out runs really low and you can't pull water out of it without running the stream dry, and there's all sorts of further complications about putting certain mechanisms in to not get eels sucked up the pipes and so on. So, the whole thing's gotten rather complicated, so we're sort of focused on winter fill reservoirs down here, but we of course got the big reservoir up in *[location 2 - farm East]*.

39:20

I: Do you know what the background of these different licenses is, why you have winter abstraction in some places and summer abstraction in others?

P: you know the history of it is, I don't know exactly the history of it apart from. ..the concept is that summer abstraction from rivers has become less and less desirable. The environment agencies actually don't like it. So all water users, whether it's the industry, or the drinking water or for farming, they don't really like it so they don't really grant summer abstraction licenses anymore. But they did historically. If you're a farmer who has a summer abstraction license granted, they can't take it away from you I don't think. But they're not granting any fresh ones. They're more conducive to winter abstractions because the water is more abundant in the winter. What we're wondering is, with this new reservoir we're thinking about here, we're going to ask them if it would be possible to fill it with a winter abstraction license and find out where they stand on that. Because I think there's been a bit

of a move after the drought you know. The farmers lobby was basically at a meeting with the environment agency, asking "can you help us get over this by being a little more flexible with the rules and regulations of our irrigation water?" So that would be one thing that would be useful and helpful if they could do that. But you know within the context of the environment agency, it would not allow the water to run down so low that the ecology suffers. You can damage a river quite bad if you suck it dry essentially. So, they don't want that to happen. So the idea is that winter abstraction from certain rivers can be used and it is very sensible because that water is surplus, just flowing out into the sea, isn't it. How do you feel about that, have you heard that view before?

I: No, I'm not very familiar with that.

P: Yeah so that's about the context of it really. There are farmers who use mains water, which is really, really expensive. So they, that's something that we wouldn't really consider because it's too expensive I think.

I: At any point in the past, have you actually had to reduce your supply of vegetable boxes because of water scarcity or anything like that?

P: No, so fortunately this kind of drama we had with the drought, hasn't happened. We have been trading now for over 25 years and this has been the worst year ever for us. I mean you're probably too young to remember, but 76 was like, I was 10, and it was really bad. So this has been as bad if not worse than 76. So, you know it's like, it doesn't happen that frequently, but the worry is that it will happen more frequently. So, you got two things going on. One is the surge of more extreme weather. Some years it might be excessively wet, like 2008, 2012, and some years it's going to be really bone dry like 2018. And it's whether or not that happens more frequently. You know if that happened every 30 years you wouldn't worry too much. But if that happens every five years, or every three years, it gets a bit more worrying.

I: Yeah, and with climate change advancing it looks like the weather is going to be less consistent.

P: Yeah, that's right. You're asking a bit about flooding and that kind of stuff. I mean we're kind of, if we could make our system a lot more robust on our own farm here, if we could get the capex expenditure to spend this 40 grand - say on building a new reservoir to increase our capacity of water. Because generally speaking we get plenty of water in winter to fill those reservoirs and we could use that water in the summer. That extra capacity would really help us to deal with a very dry summer. But the big problem for us actually is, a bigger problem is a wet summer. Because a very wet summer like 2012 is a disaster for us really. It's very challenging for organic farms because a lot of our weed control for example is reliant on it being dry enough to mechanically weed. And, also, you get such an increase in fungal diseases which you probably know, we can't use any artificial fungicides so we're quite vulnerable to that. So, a very wet year affects all farmers, but I think they affect organic farmers proportionally worse. So that's also an issue as well.

I: Is there anything you can do about that?

P: Not so much, apart from, we will continue to do the things we already do. We got a mixture of topography and land type on our farms, so some fields are more free draining than others. So, we tend to save those for the times of the year, like spring, when it's more likely that the weather might be a bit sort of irregular. But also, the other fact I wanted to throw in there is that farmers, any farmers that are exposing soil, whether you're an arable farmer, vegetable farmer, forage maize or dairy farm. Any soil that gets moved, carried off the field and ends up in a water course, the environment agency now will prosecute you for that. They might well prosecute you even if it really wasn't your fault. So, it's quite harsh

actually. So, we've been working on trying to improve our strategies of how to reduce soil washes as we call it. To avoid that happening. So, it might be things like putting more crops into green manures over the winter, things like running thymes down the wedding, the vegetable beds which means that the water runs percolated to the soil profile rather than running off down the weddings. So, they're all things you can do, perhaps leaving bigger grasslands around the edges of the field. We're also using things like tracked vehicles to try and reduce the compaction of soil. You know and also doing a bit of risk assessment on a field and thinking - actually is that field a bit too steep and too vulnerable to soil wash to grow it in the winter? So we're kind of doing all those things now more than we used to, to try and mitigate this problem of soil wash. You know we don't want to lose soil from the field and the environment agency doesn't want it to go into the water courses. But I think regardless of all that is gone, we are ultimately vulnerable to wet summers, and our production would suffer quite badly and there's not a huge amount we can do about that. But I feel there's a fair bit we can do about trying to improve our water capacity if we can afford to do it. It would be a good investment given that we could get more dry summers more frequently.

48:50

I: Apart from the reservoir, have you been thinking about other technological investments that you could make?

P: In water? Well, only that you've got the irrigation, with irrigation you've always got the infrastructure of pipes and underground main and pumps and that kind of never goes away really because that needs to be maintained and periodically replaced when a pump runs out or whatever. But there's another thing that's popping for us. Because we grow salad leaves, and even though our salad leaves are not sold as a washed product, they're not ready to eat, but we try to essentially grow them to go in a salad pack and we encourage customers to wash before they eat it. But one of the potential problems you have is that irrigation water can be a source of bad pathogens like salmonella and e-coli. The source of that is quite often from things like bird droppings, from the manure that's being washed off the fields, that's sort of where it could come from. We test water and so on but to make sure that our water is fit for purpose we're quite interested in increasing our capacity to treat it with UV. What you need there is what you call, the water comes in from the reservoir and it goes into a particle filter that takes out the big particles and then it goes into a UV that takes out any pathogens that are dangerous before it goes on to water the crops. We've already got one set-up for our polytunnel enterprise and we're looking to probably rolling that one out to some field crops as well. To make that side a bit more robust as well.

I: What holds you back from doing that? Is mainly the capital investment?

P: It's partly the capital investment but we also got a few, it goes back to my point earlier, our farming enterprise in *[location 1 - farm South West]* being very fragmented because of the land base. It's hard to explain but if you imagine *our [name of farm to— East]* farm that we rent, it's 500 acres in a big rectangle of land, without any public roads going through it. It's essentially flat and fairly big square fields. Our *[location 1 - farm South West]* farm is very different, it's sort of a network on small patchy fields on quite steep topography interlaced with country lanes which have got public access which are very narrow. So, the whole ability to move water about is quite challenging. So pumping for example, we've got one of our reservoirs something like 1.5 km to pump the water over to one land block and you have to go right up. You know, it's quite a steep elevation, something like, going 1.25 km and we're pumping up quite a steep hill, so we're probably using 4 or 5 bars of pressure to pump it up

the hill before it goes up the top and down the other side, and then we might have to travel underneath a road and you have to mole under it, need a contract to mole under it and need to get a licence from the council to do it, it's just quite a job actually. Whereas in *[location 1 - farm South West]* we got this underground main which has already been put in place by a previous occupier that we've inherited. So a lot more easier to manage that one that is our one in *[location 1 - farm South West]*. But we're just looking to try to improve it.

I: What are the time frames you are planning for?

P: As a business we are hoping to be here, don't know, the next 20, 40, 50 years. We're sort of quite strategic. We look forward quite a long way. We've just, *[founder name]* who's our owner and founder, he's not actually at the time and age yet but he's been thinking about retirement in the future and about the succession of how the business will go on. *[Business continuation practice]*. So we're hoping that we're going to be ongoing into the future. So, I do feel that these investments that we are making in irrigation, the feeling of our top management and directors and so on is that it's a sensible thing to do. We're rather long-term planning than thinking about it in 5 years, which is for some companies the time length they're thinking about it. I think if sometimes I look at our farm down here and think if you had to benefit from hindsight now you wouldn't set it up in the way that it's grown and evolved. It's just one of those things, I think small businesses that grow from being very, very small to big, they kind of organically grow in size and it's quite common to have that, whereas when you're setting something up new as a one-off kind of thing it's a different development process.

56:22

I: So you're able to plan as far into the future as you would want to?

P: Yes. I think, just as a life...*[connection cut out]* when I talk to the managing director about it.. *[connection cut out]* ...we're seriously considering that, he's not just brushing it off because they recognize that a major part of our business is the raw material, the vegetables that we grow and we're a valued supplier of that. The farms that survive into the future will be the ones that take these leaps, that invest in these things that keep them going. They're the ones that will be the ones which are growing in the future, I think. The ones which, you know, sort of wing it if you like. They tend to, I mean, you know, think the investment's worth as well. You're trying to take out more of the variables that affect you, the more you can control. You know, if we can control the water supply and the way our crops get watered, we have much more chances of success, that's the way we're thinking about it anyways.

I: So, if the impacts of water related risks will go beyond what you have planned for in the future, what do you think will happen?

P: What do I think would happen if?

I: If the water related risk becomes worse than what you've planned for.

P: I think what would happen, the reality of it would be that our supply of vegetables or raw materials, depending on how you want to call it, that goes to the vegetable boxes, their supply will be severely affected. And what happens then is of course, say for example we didn't have enough water in our cropping grounds for wholes it is so dry, so we wouldn't produce any spinach or salad pack or lettuces. So those things would be brought in from abroad, and sometimes other farmers are suffering from the same problem. But if they're not suffering it's quite often very expensive to buy them in from abroad because the exchange rate might be bad or whatever. So, it costs our business a huge extra amount of raw material that hasn't been grown in our own farm in *[location 1 - farm South West]* as

you can imagine. Also, here I would really question the viability of our farm in [*location 1 - farm South West*] from a profitability point of view because we are trying to make a small amount of profit. And if we were losing a huge amount of money because our crops are failing when it is too dry, I think ultimately you would have to give up. So, you know, we haven't got that far yet, but we are seriously thinking about needing to increase our water capacity and build another reservoir.

1:00

I: Could you think of any ways of changing your core business so that you're less dependent on too much or too little water?

P: Off the cuff not really, because you'd really have to radically change. I suppose you'd have to look at the vegetables which require the water, and those crops are summer salads, spinach, lettuce, those kinds of crops really. They're always going to need an adequate supply of water to grow them properly. So, I don't know how you feel about it, but in the summer that's kind of the stuff that you want to eat, isn't it? So, there's always going to be a vulnerability there.

I: You don't think you could in the long-term change preferences of your customers?

P: Well how do you do that, you know, just give them cabbages in the summer? And cut out the salads for example? They're not really going to like that very much, are they? It just seems to me that there's going to be a demand for those crops which require water unless you can do something amazing. Like you produce a lettuce that doesn't need so much water. I don't believe that that's going to happen. We're kind of stuck with the situation where that's the case really. So, if we want the supply of those crops to be from our UK Farms and our [*location 1 - farm South West*] farm, we need to make sure that those farms and our farm are adequately resourced to water them in dry years.

I: Thinking about the fruit and vegetable system on a bigger scale, other farms in the UK and other stakeholders along the supply chain, what do you think would need to happen more generally to increase the resilience to water risks?

P: Trying to think about saving water. There's a bigger picture, isn't there of whether or not there's an infrastructure put in place where water could be transferred around the country. Whether or not that's possible, I don't know. People have talked about a network of water. I mean, that would be sensible in my view, if there's parts of the country that were wetter and had more water, you could transfer that to other parts of the country. A bit like we can move electricity around the whole country, we could move water around. I think within the context of water usage, there's loads of potential to say, to try and reduce the amount of water wastage. So, like there's a whole lot of pipes and so on in drinking water that could be fixed that would reduce the amount of wastage of water. Even within agriculture there are probably more things that we could reduce the amount of water that's going on. Or deliver it more sensibly. I mentioned t-tapes to you earlier on about a way of putting water in right around the roots of the plant. We might be able to consider that for more crops, maybe for courgettes or something in the field. That would be a more efficient way of putting water on. Because at the moment we're putting water on through wheel irrigators, sprinklers. I mean sprinklers are ok but the wheel irrigators with the rain gun, they fire the water high up and you do lose quite a bit of water that way. I think you know, that's just a few things of how we could try and improve it.

1:05:47

I: Are there any things that you think shouldn't be changed at all in the way that we currently use water for fruit and vegetables?

P: What I think shouldn't be changed? I don't know, other than I think that we ought to try and use the resource more sensibly if you like and try and reduce water wastage, I'd like to see that on our own farm. So, water wastage is a big issue and I touched on it, there's a lot of infrastructure with pipe work for drinking water that is leaking basically and it's a travesty really cause all that water is just leaking away. But we have it with our irrigation reservoirs on the farm. Because we're kind of on quite difficult soil even though we line them with clay they quite often leak. So, what we did this year was one of the ones that leaked, we had some access to clay and we brought in some clay and realigned it, so that it leaked less and we're really pleased that we did that because it happened to be one of the driest years for thirty years. But I think that kind of thing. Just thinking about is water wasting? Is it coming out of pipes that are leaking or need replacing? Just making sure that infrastructure is all tip top or improved is a good starting point. And then going back to the point from earlier on about water capacity, whether it's reservoirs and so on. And in the ideal world having some flexibility....*[connection cuts out]*

I: You were just cutting out. What did you say about what would happen in an ideal world?

P: Sorry did you miss me? What I was saying was that we work on two things, one is to improve the infrastructure that's pipes and reservoirs to make sure that water won't be wasted. And I think about the way that water is being delivered to reduce the amount of waste. Another example would be that thinking about water that's landing on roofs and so on and buildings, that water can often, with a bit of investment, can often just be piped straight into a reservoir rather than it just disappearing into the stream or into the river. We can take that water and put it into the reservoir. That's what we do with our polytunnels because we got 3 acres of roofs and all that water goes into an irrigation reservoir and we're catching all that water rather than it just going down the river. So, there are things that you can do to help with that. And the other thing I was saying is just making sure that our capacity of reservoirs and infrastructure of mains and so on is kept sufficient to take that water and store it, essentially.

I: Do you think there's other groups of people who would have other opinions?

P: I would think that most people this issue touches on would probably agree with what I'm saying. I think the probably more controversial view would be, and I don't know whether people would come out with it or not, would be an abstraction of river water in the summer. That would not go down well with a lot of people. I don't think that will ever change now. And I could see the logic of it really. I think because rivers and streams and so on are vulnerable in dry years, they run low and the last thing you want is having every last bit of water sucked out by other users. Which is why I think it's a sensible investment in storing winter water which is abundant and using that in the summer is a really sensible way forward. But it just requires a lot of capital investment. So, if there was any spare money available that could help farmers build reservoirs rather than them having to fund it themselves that would be really valuable.

I: Yeah, that's a good point. Those were all the questions I had, and we touched upon many more things than I had originally intended.

P: Are we done? Was that enough information?

I: Yeah that was loads of information, that was a good perspective to get. You've clearly been thinking a lot about these things.

Bye bye small talk.

Interview Transcript #5 – large international fruit and veg grower and importer, focus on avocados

October 2018

0:00

I: For a start would you be able to talk a little bit about how your company works with fresh fruit and vegetables and which ones you mainly focus on?

P: Well we are actually avocado growers ourselves. We are a *[nationality]* company. We are one of the largest avocado growers globally. We have growing operations around the world, mainly South Africa, Peru, Chile, Columbia, Portugal, North America, and a number of growing groups based around those growing operations.

I: Ok. And then you also import other types of vegetables or only avocados?

P: We do import other types of vegetables and fruit. So as a company we got a number of different business units of which general wholesale is an important part where we do a plethora of different fruit and vegetables, in addition to having a well-established citrus business which is used for juicing as well as wholesale. But predominantly we are avocado.

I: Do you only supply to the UK or to other countries as well?

P: We've got a number of different marketing companies. So *[organisation]* is one of many. We have a company based in *[country]*, *[country]*, again a marketing company in *[country]*, one in *[country]*. Again, the growing operations and a marketing company in *[country]*, and *[country]*, and marketing I supposed in a way as an exporter in *[country]* as well.

I: Which other organisations do you mostly interact with in terms of who supplies you, who do you sell to?

P: *[organisation]* in its own rights is supplying to the majority of the retailers as well as we have an established and growing food service and wholesale market business as well.

I: The farms, do you own all of them yourselves or do you buy in from independent farmers?

P: Wherever we have growing operations, we grow in groups to supplement our own production but then we support agronomically because we have our own variety and rootstock.

I: So, which other businesses in the supply chain would you say affect your operations most?

P: Transportation is a matter of fact in terms of freshness. From the growing operation I guess it starts from the beginning, nurseries, root stock. Fortunately, the root that we got is from our own nurseries, so we're not so affected. I suppose chemicals in terms of the pesticides, insecticides, herbicides that we use but that's going increasingly more biological and it's definitely IPM based. Transportation like I said, everything to do with transportation and clearance. I suppose traders who receive it, our needs in terms of energy and these sorts of individuals. But clearly in terms of focusing on water, without water we can't grow. It's something that we're very, very focused on as a business.

4:23

I: So, what would be the main water risks that you're facing?

P: Well, I suppose not in every country of origin we go. So if you go to Colombia there's plenty of amount of rainfall. But certainly if you looked at the water maps and where the risky areas are and will be, those areas which we focus on - certainly in South Africa just recently *[location]* went through a long spell of dry weather - but again we're fortunate that we have our own reservoirs and we like to be ahead of the curve in terms of developing and investing in infrastructure that reduces the amount of water we require. Because the water

we have, whether it's investment in new technologies or increasing the amount of mulch in the soil, the soils get a better water retention to conserve runoff when it does rain.

I: Have you ever been affected by other risks like floods or hygiene problems?

P: I suppose again climatically El Nino, when it comes around, affects us negatively. But again, I suppose with climate change that everything is experiencing at the moment that weather events are becoming a lot more the norm and making growing a lot more difficult and riskier. When it's a risky occupation anyway.

I: And in terms of water regulation in your farms, do you usually find ways to get access to the water that you need?

P: Again, we meet all the legal requirements in terms of the water that's applied to us but we're always trying to get more bang for the buck in terms of reducing the amount of water that we need. We got a number of different projects that we got in place at the moment to see whether you can keep reducing the amount of water that we need to grow.

I: Have you ever had negative impacts in the past in terms of having a severe drought and not being able to supply enough avocados?

P: Again, we've been fortunate that certainly while in South Africa we did have a long dry period that the techniques that we put along which are focused on water conservation we've been fortunate to be able to get through those drier spells. But again, I suppose we're unique in a way. Our founding father, [name] set up the business on the [date] based on very thorough ethical and environmental principles which we work to today. So we've got our own research institute which means that sustainable farming is something that's in our dear name, we're constantly looking to improve what we do to make sure we've got a sustainable future for ourselves both also for all the people that are directly influenced by our fruit and greens.

7:55

I: How far in advance do you plan into the future with your investments and innovations and things like that?

P: Well I would say up to about 25 years. It's what takes our timber plantations which are on a 25-year rotation. All the investment, we have a clear business plan which is updated on a 25-year period. I suppose if you look to those crops and products that we grow, the longest rotation and lead time in terms of actually coming to commercial fruition. I mean we take into consideration that we won't plant in water catchment areas and those sorts of considerations. We do environmental assessment plans before we consider buying or growing in a particular area, we fly in experts to do that analysis for us. Temperature, water, soil, and then cost it out to see whether it's worthwhile to pursue or whether we can have a significant negative effect on the environment in the surrounding area.

I: So that's very much at the core of your operations?

P: It's where we put money and grow, we will carry out one of these plans in detail. We've walked away from areas of investments in the past where things haven't tied up.

I: The core strategies for you to plan for water risks are then technological innovations and water catchment, water reservoirs, these kinds of things?

P: Yeah, definitely. Investing in new technology as well as looking at soil organic matter, things like that, you know. In a new plantation in Portugal, we use a plastic cover around it because we grow on sandy soil to maintain the microclimate within that soil to reduce the amount of evapotranspiration and employ windbreaks to reduce the evapotranspiration from the trees. As well as looking at long term sustainability to make sure we don't have a

negative effect on where we're drawing water from. Making sure that we don't negatively affect the water catchment area or the baseline.

10:30

I: What would you do if you realised that that's happening?

P: What would we do? I don't know the honest answer because we never thankfully came across that. But obviously we would bring in a specialist actually to review the information that is required to indicate that we are having a negative effect. If it came to the fact that it wasn't sustainable to grow there then obviously considerations of long-term future of that particular growing area would have to be considered.

I: Ok, but you never had to deal with that before?

P: Thankfully no.

I: And this 25-year timeframe is how far you would be planning ideally into the future or would it be better to have an even longer plan?

P: Well business plans are continuously reviewed and updated in terms of the changing economic and climatic situation, so things are constantly reviewed on an annual basis to be honest with you.

I: And so, let's say if the water-related risks in the future for some reason would go beyond what you have planned for, what do you think would happen in the short term and the long term?

P: If we found an area we invested in would have no rainfall for the next few years, again we would have plans to see whether it's viable to grow there and to see what impacts we would have on the areas if we did continue to grow there.

I: And if not, you would look into other growing areas?

P: Correct. There's no point in putting money into an area where you haven't got a long-term future or have a positive impact on both local communities as well as the ecology.

I: How much scope is there for breeding avocado trees that need less water, are you researching that as well?

P: Yeah, we are. Again, that goes down to the root stock, so again we develop disease resistant rootstock as well as rootstock of different varieties that need less water in combination with the technical as well as the IPM and mulching and such things that we carry out.

I: If in the long term you would see that growing avocados isn't feasible anymore, would it be an option for you to switch to a less water intensive crop and change the core business?

P: Yes, it would. But again, if you look at avocados, we've done a study ourselves and certainly after the Chilean Petorca situation it became even more focused. And avocados compared to a number of crops are not that water hungry. Yes, they need water, everything needs water but in the rank of 10 crops I think it came in roughly from the top of my head it came in right in the middle. There's a lot more water hungry crops compared to avocados.

14:15

I: Do you remember what was at the top?

P: Hold on if I can try and get the presentation. Yeah, we map the green, blue and grey water that we use in each of our operations. Obviously, you study that. We partner up with WWF, so we are being part of a project in *[location]*. In terms of looking at the sustainable use of water resources. In terms of the crop list, I can't see it *[the presentation with the water-use comparisons]*.

I: No worries if you don't find it. That was just out of personal interest.

P: If I come across it, I will put it over to you.

I: Thanks that would be great. So, are there any other strategies to increase your resilience to water risks that you can think of but haven't been able to implement?

P: Things like shade netting which I suppose is along the lines of wind breaks. But again, it's really about finding the right areas to grow and invest your money in. Because it's not cheap to grow and the last thing you want to do is go somewhere with no long-term future. But again, with climate change and the frequent events that we are experiencing at the moment it's becoming less and less easy to predict what the future is going to be.

I: So, you said you grow in Portugal as well, is that your only plantation in Europe or do you have more?

P: It's our first plantation in Europe, yeah.

I: Was that heavily affected this summer by the drought?

P: No, it wasn't. Because again we flew scientists in from the States and South Africa to review the area we were going to plant in as well as carried out environmental studies on the underground water and that we were not going to negatively affect it in terms of the water that we predicted to draw from. As well as investing in the latest technologies in terms of maximising the amount of water we use and minimising the total flow onto the growing area.

I: Because a lot of people I have been interviewing have had really bad experiences this summer.

P: Well it's been an extremely warm summer, it was extremely warm in the UK and it certainly affected negatively a lot of potato growers in the UK and they struggled. But again, it's about trying to predict as well as making sure that you've got all the tools necessary to survive these freak weather events. I mean we've had one of the severest frosts in Portugal last year. Temperatures down to -6° which haven't been recorded in the last 25 years of weather records. How do you mitigate and plan for that? It's very difficult.

17:55

I: Yeah, that's true. So, the strategies that you haven't been implementing is that mainly because they're too costly or just because they're not necessary in your growing areas?

B: Which strategies are these?

I: The shading you've been talking about or additional water management practices?

P: In certain areas where we feel it's going to have a positive impact then we do it. So, one of our early season plants in South Africa, there we've got shading in place.

I: So, is there anything you would want to implement but can't because of external factors?

P: Well, I mean you never say never and there may be something we may not be aware of but we're always exploring new technologies and ways of growing to try to minimise the amounts of resources we use, but again it goes back to finding the right areas to grow in the first place. You know, form a solid base, then you've got a chance to make sure that you've got a chance for the years to come.

I: So that means that you tend to have the required capital that you need to make all these investments because I guess that's always very investment intensive?

P: We're very fortunate that the *[organisation]* is a shareholder within our company, so they provide the resources to be able to fund us. And again - that supports our environmental and ethical credentials in terms of making sure that we meet their requirements of being a lender as well as a main board member of the company.

I: Ok. Are there any other external factors that affect you and your environmental operations?

P: Brexit. Who knows what's going to happen with Brexit...

I: Are you undertaking any measures already in this sense or are you just waiting?

P: We're taking what actions we think are pertinent, but who knows. But yeah, we are planning obviously it would be crazy not to plan.

I: Can you say what you're planning for?

P: Well we're looking at routes into the UK, potential bottlenecks, costs of goods, potential duties if we went through the WTO, what would definitely cost us that as a business, supply chain definitely. Period of time in terms of goods cleared, we're all trying to look at the worst-case scenario. But again, it's like sticking your finger in the air because nobody knows.

21:30

I: Do you feel like that could grow into a really big problem?

P: Potentially.

I: I guess all the importers would be affected in the same way.

P: Yeah, exactly.

I: It's a little crazy to think about how they haven't come up with a plan for any of this.

P: It is crazy to think about it. Because we're used to it, I guess the retailers have done such a good job with supplying a consistent quality of things that we don't grow here in the UK so that we just take it for granted. And a tremendous amount of fresh products is imported in the UK.

I: Yeah, the majority of food is imported so that would be a really big problem.

P: Yeah, potentially. I just found that slide. So, of the top 10 water intensive crops, avocado is number 9. The top is cocoa beans, then cashew nuts, and pistachios. Green and black tea is number 4, number 5 is olives, dates, then plums, asparagus is 8, avocado is 9 and rice is 10.

I: That's interesting because avocados are getting such bad press about their water use.

P: Yeah, it's the NGO report but again it's depending on what information, what your drive is. You know, you can create what you need to create.

I: If you're thinking about the food and vegetable supply system as a whole, do you think anything should be changed on a bigger scale to increase resilience to water risks?

P: Well I think, you know in my humble opinion collaboration is the best thing that you can do to try and really affect positive change for an industry. The problem is we're all so commercially minded working for a very little and more and more competitive environment. It's very unlikely that people will collaborate. Certainly, on something as significant as water, being affected by climate change, yeah, something that everyone really needs to get on board with.

I: What kind of collaboration would you want?

P: Well I think, ok, if you took the Chile Petorca situation, again that's in a way very much government based. If the Chilean government actually put the investment in to capture more of the runoff that comes from the Andes, because they've got lots of water. They just don't have the infrastructure for catching it.

I: What's the case about?

P: In the UK I think I don't know, I mean I'm not a UK grower so I'm not that close to it in terms of the real pressure and demand. But I suppose just hearing from potato growers and such you've got some areas that take the necessary precautions in terms of water capture in times of heavy rainfall and then looking at new technologies. Whereas some people still happily, according to their quotes, are taking water out of the river next to their farms.

Again, if it was all more joined up and there were grants specifically for reservoirs or for the deployment of new technologies that would make the whole country a lot more sustainable.

I: So you feel like UK farmers could learn a lot from your practices?

P: Yeah, I think UK farmers could. Not just ours, but obviously also other countries and companies that grow in water-stressed areas or areas that have had a history of drier conditions. I think there's some cross-learning that can be happening.

I: And is there anything in terms of water management that you think really shouldn't be changed?

P: Again, I'm not a UK grower so it would be difficult for me to say what should or shouldn't be changed.

I: Ok, from your perspective - in the areas where you work?

P: Currently it's being part of the EU. Trade is relatively easy, there's very little barriers, there's very little sanitary requirements, I think the EU has been a positive thing in terms of minimising residues in terms of the LAD, which is making people look at more sustainable farming practices. I think we're ahead of the curve in terms of sustainable production. Keeping the environment as well as ethics coming to the front more and more these days compared to other countries in the world, see the States. I would say we're light years ahead of the States in terms of our agricultural production as the EU.

I: Do you think there would be people who would have a different opinion to you?

P: I would imagine everyone would have a different opinion, but I would imagine you can get very patriotic in terms of UK production being the best in the world. But you know, there's very good growers outside of the UK and outside of the EU. My experience travelling the world says it's down to the individuals and the individuals' mentality and foresight more than a country specifically. But obviously legislation helps to support people's direction so in a way I would say obviously growers, the good ones should be roundly applauded for the working efforts they make because sometimes they have very little governmental support or structure to work in.

I: So, you feel like there could be more done in terms of policy and regulation and support programmes?

P: Again, I think if you take countries in Latin America or even in America itself if you look at the amount of deaths which are micro-results, I would say as a whole the EU and the UK is well regulated, there's sensible regulations for the future of farming and growing.

I: Alright, that sounds good. Ok, so those were the main questions that I had.

Bye bye, consent sheet reminder, etc.

Interview Transcript #6 – international grower of mainly leafy greens
(two participants)

November 2018

P1: Ok, so [Participant 2] joined me. [Participant 2] looks after the CSR and the environmental piece at [organisation] amongst his other roles so I thought he might well be able to add some value. And he's also very familiar with the farming operations as well.

I: Great, thanks for taking the time to join the call.

P2: No problem.

I: Alright, so the first thing I have to ask is if you're happy with me to record this call so that I can transcribe later, makes it easier for me.

P1: Yes.

P2: Yeah.

P1: And you should have received the documents as well.

I: Yeah, I just saw your email, thanks for taking care of that.

P1: That's alright.

I: Ok. So, to start off, would you be able to explain a little bit about how your company works with fresh fruit and vegetables?

P1: Right. We're probably one of the biggest salad growing businesses in the UK, in Europe really. We're a grower and organisation of family businesses that works mostly with its own owned land but also works in a producer organisation with other farms and also has some traded relationships, too. So, we supply retailers in the UK and in mainland Europe and we have some brands that have operations in other parts of the world like [country] and [country]. But effectively we are best known for being a grower of leafy salads, root salads in mainland Europe and the UK.

I: Do you grow most of the produce that you supply to the UK in the UK or in Europe?

P1: It's about half and half. It's very seasonal the crops that we grow. So, we grow salad crops in the UK in summer and then in Spain in winter. In its simplest form.

I: Which other businesses and organisations do you interact most with?

P1: Retail businesses mostly. We do work with processors as well, so we provide leafy products into the processors to make ready to eat foods. But our biggest business would be with the retailers.

I: Do you already provide the salads washed and ready to eat?

P1: No. We have a very, very small washed and are ready to eat business. It's tiny in comparison to the rest of the business. Largely we are ready to wash.

I: Ok. Which other businesses in the supply chain would you say affect your operations most?

P1: In what context?

I: In terms of who you depend on for growing inputs or who you can sell to, sales relationships, I don't know if you transport much as well.

P1: We're pretty independent really. I suppose we do everything ourselves apart from growing seeds. So, I suppose seed companies would be an important interaction we have and apart from that we do pretty much everything ourselves including manage our own transport although we don't own a fleet. We do organise most of the transport ourselves

until it gets to the final purchaser really, whether that's a retailer or processor. So, we're pretty lucky that we don't tend to be influenced that much.

I: If we focus on water, what would be the main water risks that affect your business?

P1: Spain would lack water and quality of water.

P2: And nitrification of local water sources.

P1: And then the UK would be water quality, so we irrigate using sort of local water sources, so we have to be careful with the water quality from a microbial perspective. We operate in *[West African country]* as well and microbial quality would be an issue there, too.

I: Why isn't that so much of an issue in Spain?

P1: Microbially the water is really good, so Spain because of the solarisation tends not to have a microbiological problem whereas we don't have those light levels. So we tend to have more issues with pathogens in the water sources as a general rule. Spain's issue is scarcity.

I: Have you also been affected by flooding?

6:04

P1: Yeah. In the UK I suppose. We are tending to see particularly in the UK more extreme weather events, so we'll have a deluge of rain that floods a growing area but then we were very badly affected over Christmas in 2016 with those floods.

I: You would still view water scarcity as the bigger risk though?

P1: Yes, in Spain certainly.

P2: Rainfall doesn't really assist with the irrigation scheduling in Spain at all whereas we can base irrigation scheduling in the UK on estimated rainfall for a certain period of time whereas in Spain it's almost the assumption that there's going to be no rain in the amount of irrigation. We could have an event where there is a flash flood, but that wasn't kind of factored into, rain isn't really factored into when and how much we irrigate. Whereas a lot of growers in the UK, root crops etc. won't be delayed, they don't even plan to irrigate their crops, because it almost always rains during the crop cycle.

I: Do you also deal with any regulatory risks in terms of whether your water access might be restricted or new incoming policies?

P1: Yeah, pretty much everywhere where we work, we're working under a licence framework. So, we have a certain amount of water we can use, and we will then need to manage that water use. Some countries are more flexible than others. I believe we got a set up in the UK where we can release winter stored water back into the river network once we get to a certain level of our licence, whereas in Spain it's very clear that when you exhaust your licence you can't use that source anymore.

I: And in terms of business impacts of these risks, have you faced any negative consequences in the past or have you always been able to manage water risks?

P2: In Spain there have been occasions when we had to miss irrigation schedules of crops due to scarcity of water. In the UK there haven't been any droughts recently, there haven't been any occasions where draughts have caused us to not have access to water, even this summer. We weren't restricted in our abstraction from water courses. Whereas in Spain there have been recent examples where we have not been able to irrigate.

P1: Or we have changed planting regimes. We were going to plant in a farm and we couldn't because there was no water available.

I: And then did that have any effect on your water management practices in the future?

P1: Not so much in our water management practices because we are so limited with what water we have available to us, so we can't. We're very used to using as little amount of water as possible. It's had more of an impact on our agronomy. So, whereas we would

normally not plant celery constantly in the same place, we've exposed ourselves to disease risk within celery because we had to keep replanting in the same place, because that's where the water is.

P2: Which can then affect supply as can moving crops around different regions, it might have a different climate. It can affect our supply to customers.

I: And this summer was alright in Spain as well?

P1: It was quite wet this summer in Spain actually. Yeah. So we tend to only grow in Spain for the domestic Spanish market, but having said that, because of availability issues in the UK, not necessarily driven by a lack of water, but the heat was to a point where very often the crops weren't growing because it's just too hot for them and then the businesses weren't fulfilling their programme so couldn't be put under pressure. So we'd actually buy Spanish lettuce through this summer at times. But they've actually had quite a wet summer, so I think their winter, their reservoir situation is in a positive state.

I: Would you be able to explain a little bit about how you generally manage and plan for water risks in your business?

P1: So, in the UK I think we saw a pattern 10 years ago of lowering rainfall through the UK summer, so an expensive programme was reservoir building, that happened on some farms. In other farms we've laser levelled the land and we used the dyke irrigation system to sub-irrigate. So, if you lower and raise the level of water at the subsoil level through using dykes. So, we've been cognisant of the fact that there may be less water available and those irrigation facilities have been improved. In Spain we've worked towards water minimisation, so again laser levelling of land, drip take irrigation, building of reservoirs and purchasing land that has irrigation opportunities, so buying or renting land with good water rights. We've also been involved in the building of community desalination plants, so we can get to water in that way.

P2: There's been research as well. So, we've got [name] who's doing his PhD in irrigation management. There's been investment in sensors, in monitoring the soil moisture and irrigation at different levels of the soil. So, growers are trying to use precision irrigation rather than over irrigating their crop and only irrigating where they think they need to which helps irrigation levels as well.

P1: In terms of microbial risks we've got an extensive programme of use of ultraviolet light, so we'll use filtration to improve the turbidity (?) and then use ultraviolet light to decontaminate the water. So, we will test water quality and then use a mixture of chloride oxide and UV to ensure the quality of the water when we're using it overhead at certain points of the crop's life. So, if it gets closer to harvest, we make sure that the water quality is good.

I: Are you also looking into breeding more resilient plants or does that have less potential?

P1: I would say that we are further along the road to using LED light to manipulate root habits than we are breeding. Because we don't have it in our hand. We don't have seed breeding in our hand and we're a relatively small part of the produce industry. We don't have a lot of influence and actually there's more emphasis on some of the other problems with lettuce, so disease resistance or insect resistance rather than drought resistance. A lot of the work that has been done on partial root drying and improving quality doesn't really have a benefit for us most of the time. Because most of the time we're not dry here. So, influencing the habit of root growth is more what we would be looking at with LED light and different light waves.

P2: And plant type as well. Planting of smaller plants from the greenhouse that don't have as deep of a root structure and require less irrigation when they are planted out in the field.

I: And how far do you currently plan into the future with these things?

P1: Would you say, 5 or 7 years?

P2: Yeah in Spain, water management plans are 3-5 year plans. How long are the water licences that you get?

P1: Not sure.

P2: It is definitely about a 3-5-year plan in growers' minds at least. Thinking about it, you hear snippets of the EA saying that they are going to restrict bore hole use for agricultural use in 2020 or something like that. Yeah about 3-5-year plans probably.

P1: Specifically, in Spain where there's such a political impact on water because it's very much a north south divide with water in Spain. The north has all the water and very much resent giving it to the South. It's a bit like Birmingham and South Wales really.

I: Are you able to plan as far ahead as you would want to?

P2: Things like politics and things like changing trends in what's in the media can have quite swift impact. So, policy and what we're allowed to do and when that trickles through from our retail customers who can sometimes hop on things they see in the media can have quite swift effects. The change or the impact can happen quite quickly. So, if it gets picked up in the news in Spain it can change things quite quickly so it can interfere with plans if you look at 5 year plans for example.

P1: Yeah, I think Spain is most vulnerable with the perception that horticulture has had an impact on that Mediterranean area of particularly the Mar Menor region. I would say there's most likely political action on that Mediterranean coast between Almeria and Aguilas, in that sense. Rather than the UK. I think we are not close enough to a substantial change in weather pattern to really have a political influence on what we do.

I: Are you reacting to that on some level?

P1: In Spain, yes. I think that ensuring that we're using less water. Trying to ensure that we maximise the capture of winter rainfall, you know, we haven't relied on the trends passing. We're trying to make sure we're on the front foot with all the legislation that's coming in in terms of vulnerable zones and the nitrification. We are trying to make sure that we are, because we're quite visible because *[sensible information about company size and visibility]*, we can't hide in any way. So, we've had to make sure that everything we're doing is as effective as possible and as minimising of the environmental impact as possible:

I: In Spain, what's the long-term water management planning? Do you think there is going to be enough water far ahead into the future or are you also thinking about moving to other growing areas?

P2: Do you think planning in terms of a policy level or do you mean for our business?

I: For your business.

P1: *[Sensible company information]* That whole area was identified, you know, at a time in the Spanish Civil War as a horticultural production area so I think even when the politics gets quite aggressive, both factions recognise that there's an awful lot of revenue generation in that area in Spain because it's the most appropriate area to grow a wide variety of fruit and vegetables at that time of the year for the whole of Europe. So, it's, we're not the only ones there and we must be, there is a massive revenue generation for that whole mainland Europe piece as well as the UK. I think it would be short-sighted from a government perspective if it was curtailed. They'll have to find solutions, they'll have to help us continue to find solutions.

I: And in terms of environmental boundaries, you feel like it's going to be feasible for a longer time to grow there still?

P2: Yeah. We know our risk, we do risk assessments and try to identify water and nitrogen vulnerable zones. We can then implement specific strategies to make sure that we're reducing the impact that we would have on water pollution or water scarcity. So we've been trying to identify environmental risk in the different areas of our farms and then make plans for those areas but not necessarily move out of those areas.

21:10

I: So, if the impacts of water related risks would go beyond what you've planned for, what do you think would happen in the short term and in the long term?

P1: I suppose you got to cut your coat according to cloth as it were. If we have reduced the amount of water, we have reduced the amount of salad which would mean increased price inevitably. I think that's the inevitable. So, we did see there's not as much overgrowing of leafy salad crops as there used to be. We saw a lot of people moving into artichokes over the last couple of years because they're more tolerant of saline water. So, you just see more expansive salad crops because they won't be overgrowing, they will be very specialist growers that have the resource, there will be easier crops to grow with less hassle.

I: Would you be considering moving to other crops that are less water intensive if you can't get enough water?

P1: No, we would be more likely to move to other countries.

P2: We would be part of the specialist growers probably.

P1: We'd be unlikely to get out of leafy growing let's say artichokes. We'd be more likely to be managing our water resource for the crop we had available or looking at other places to grow. So, *[West African country]* is an example where there was lots of water and it was a good environment for growing certain crops. So, we've gone out there and forged a relationship with the government. And they're trying to make that work for us. That is obviously, that would add constant if it was a perishable leafy product because there's quite a long distribution chain but there's options there essentially.

I: In your growing areas in the UK, I guess there's still a lot more flexibility in terms of water management or are you having as strict boundaries there?

P1: No, I think I would say...

P2: We're less tight for land in the UK as we are in Spain. So if we do need to move crops around in the UK we've got flexibility in our land base in each region to be able to make a custom for maybe a coastal region doesn't have enough access to water so there's a central region that would be able to take some of that extra crop on. Whereas in Spain the land value is high and its premium. So, we don't have the extra flexibility in land that we do here in the UK to be able to move crops around in different regions without affecting the supply chain too much.

I: Are you already using the same kind of water saving strategies in the UK as you do in Spain?

P1: Not to the same level because so many of our irrigation events are natural rainfall. So, the very worst of the hot summer this year we were investing in some drip take would be the most effective irrigation method and we were looking at that on lettuce but the cost if you don't absolutely need to do it is just prohibitive because it's very labour intensive. You could start to implement methods if you knew you weren't going to have rain events. But most summers there will always be enough rain events.

I: Are there any other strategies for increasing your resilience to water related risks that you can think of that you're not using already?

P1: I suppose there's almost, there is that genetic piece so we're not really using that at the moment. I know that there are some, so one of the things that parts of the business is looking at is the soil organic matter. So, I think increasing soil organic matter increases water holding capacity. And then there are some artificial methods of increasing water holding capacity that are agrochemicals trialled on some of the broad acre crops this year. So, there are still things we haven't looked at that we could do. We are trying to improve the soil organic matter and that will have a positive water retention effect as well.

I: Why have you not undertaken these at this stage?

P1: I suppose there's not been a need, again, in the UK it rains lots so it's not that we've got plenty of stored water and we're happy throwing it on overhead irrigators, we genuinely don't very often have to irrigate. You wouldn't be looking at putting those efforts in if you weren't actually irrigating because it does rain most weeks. A lot of the time we're swearing at the weather to stop raining because that has an impact on the quality.

26: 45

I: And in Spain you exhausted most of the options?

P1: Yeah, I would say that we're ahead of the game in terms of drip irrigation, in terms of scheduling, in terms of the way we plant the fields up so we're not getting run off.

P2: And things like environmental barriers with crops around the fields. Runoff as well, looking at using different types of agrichemicals that aren't as persistent in watercourses or that don't runoff as much. I think we've probably not really done a lot into automated irrigation that is controlled using sensory information and irrigates when it has reached a certain threshold, or is dry enough for it to irrigate. That's maybe something else that we can look at sensors in the field and drip tape that can be controlled automatically.

P1: Soil organic matter is something we're absolutely looking at still and it's very often sand in Spain, there's very little organic matter in soil so it will take a long time to improve it but we're trying to do that, a lot of composting and creamwaster (?).

I: Limiting factors for technology use, is it that they're very capital intensive? Or does it just take a long time to set them up and plan?

P2: Things like sensors, technology like that is capital intensive. I think probably the inhibitors of soil organic matter is that it's hard to measure it and it takes a long time to slowly improve it.

P1: Yeah. I mean it would be lovely to wait for the magic wand and have gene editing. I think if we were allowed to do gene editing then you would see the advances in crop breeding and you might well find that you had drought tolerance. But at the end of the day a lot of what we grow needs mostly water.

I: And so do you also export anything from the UK to Spain then if growing conditions there are better?

P1: Occasionally. In the same way we export a bit of Spanish produce to the UK in summer we will sometimes send it the other way, I think we send radish abroad, don't we.

P2: Yeah, they buy it in Holland, radish. We do supply some European markets when we can and when the price is good.

I: So, could you imagine a scenario where the UK will be a better growing area in the future because of water?

P1: No, it's too cold in the winter so if you think we're starting to import from Spain now, you know it's -2 in the morning here. It's 6° and cold and wet outside now. So it's not good lettuce growing weather here now.

P2: So, things like stored crops and root vegetables and overwintering crops you could, but our speciality, leafy salads and leafy greens, they don't like the winter.

I: And then greenhouses are also too expensive because of the heating?

P1: Yeah, the daylight, so you are looking at the lighting and the heating and the acreage. I think we have 14000 hectares of salad growing land between Spain and the UK, so you would be looking at an awful lot of greenhouse.

30:38

I: Thinking about the fruit and vegetable supply system as a whole, other businesses as well and retailers and food processors, what do you think could be changed in general to increase the resilience to water risks?

P1: I think the processors do rely on quite a lot of water. So, I think that there may be work around microbial contamination of water and using less water in washing possibly. I don't know, maybe the price of lettuce will just have to go up. If you look at it in terms of litres of water and kilograms of product, it's not a terribly efficient use of water should the whole, should the global position be that of reduced water opportunities. So maybe it's a bit like meat eating that comes 10, 15, 20 year's time, we will be looking at a different picture because it's just not ethical to be using that much water for that product.

P2: When you factor in waste on top of it. I think probably reduced waste through better planning and better forecasting could have a big impact on the amount, generally on resources used so water is included.

I: Ok. Do you know how lettuce and leafy vegetables compare to vegetables with similar nutrient contents in terms of water use?

P1: Only anecdotally. So yeah, not really.

P2: I think with nutrient content we're on the lower end of the vegetable nutrient scale aren't we.

I: So, from a health perspective it would make sense to switch to broccoli or things like that.

P1: Yeah, not sure. Don't know enough about it.

I: Yeah, no worries, that was just a random thought of mine.

P2: You'd also have to consider the time the vegetable needs to grow, brassicas need a lot longer...

I: Is there anything in the supply chain, the system, that you think shouldn't be changed in relation to water?

P1: Difficult. I don't know. The use of licences I think is perfectly reasonable. I think that damage can be caused by over-extraction. So, I think there's obviously, we're in a very environmentally sensitive area in the East, over-extraction would obviously be damaging. In terms of Spain. Spain waking up to the damage of the desal plants and the use of nitrogen of course is I would say welcome. I think they just need to recognise that some of their tourism activities such as golf courses are just as damaging as horticultural events. I guess some people would be disagreeing with me, they don't like the dusty background.

I: Do you think there's groups of people who would have a different opinion to you?

P1: I suppose there's always polarisation. I would say that smaller growers that have got away with flood irrigating would find our obsession with level land and drip irrigation silly. There are farmers all around the world for whom regulation is not welcome. You know there's farmers now saying that they want to reduce the burden of traceability of livestock.

There's the problems we know we have with foot and mass scrappy and BSE. There's always farmers that will require less legislation. Counter to that I would say that you would probably trip over environmental bodies in Spain that feel we're not doing enough.

I: Ok. These were all the questions that we have. But you're very welcome to voice any other thoughts or add things that were missing.

P2: That's probably very location specific, you're tied to this increasing the resilience of the UK fresh fruit and vegetable system. But the location of the growing or the production is very, very related to the priorities and the risks that occur at that place. So it's quite difficult to make very general assumptions even in the UK in our growing regions about what are the priorities or risks.

P1: Because we have areas that we irrigate via borehole and water quality is excellent, whereas we have areas we irrigate that don't. It can be less than ideal. And horticulture is very varied.

I: Yeah, we have made that experience with the interviews as well. I've also talked with some producers in Northern Ireland for example and they say they've never had any issues..

P1: We're going to have to go, there's someone waiting for the room. If you have any more questions, you have our email addresses, feel free to give us a shout.

I: No problem, thanks a lot for taking the time.

P2: Nice to speak to you, bye!

P1: Thank you, bye!

I: Bye, bye.

Interview with the manager of the sustainability programmes at an international retail company

How do you use fresh fruit and vegetables?

We have a number of food and pet food products, of which vegetables are a part of the recipe, we have no fresh fruit or veg offerings as a part of our product portfolio.

So you buy in fresh fruit and vegetables and then process them?

Vegetables, but not fruit.

And Vegetables are for pet food?

Well proportionately, in terms of tonnage and diversity, the most vegetables are for pet food, but we have a food business which is primarily, in terms of vegetables, is tomatoes and peppers for [insert product names]

Do you source from the UK or abroad?

It depends on the market, we tend to source locally when we can, the challenge is that we've prioritised five major issues for sustainability for our business, and when we look at the major risk areas for those issues, vegetables are not a major priority, and water impact, our impact on water, is one of the considerations, but I have a larger issue on water, than the fruit and veg that is going into the supply chain.

What would they be? The issues.

For water, we have ten raw materials that are our... so we are looking at greenhouse gases, water, land, human rights, and income – across our whole supply chain. I source 6.5 thousand raw materials every day – but about ten major raw materials describe about 80% of my issues. So we've taken a materiality review and said look, what we will do is fix the things where we need to move the needle, but we have a very long tail. So it is not that we are not doing anything in the long tail, it's just that we don't move the front of that issue, we won't make any progress at all at any sort of scale.

So for me, its beef, sugar cane, sugar beets, dairy, cocoa, fish, palm, soy, its rice, pulp and paper... oh mint is another one.

Why is it that you perceive these as the most significant risks than vegetables?

Well, because they are. The GHG issue related to cocoa, dwarfs the GHG issues related to other raw materials in my supply chain. For example, 25% of the tonnage of the things I buy is corn but I only buy 0.1% of the world's corn. So saying I'm going to fix corn, or that I should be doing lots of work on corn, whilst it is a big percentage of my total volume, I am not going to move the needle on it. The way that businesses, global commodity buying businesses move the needle on issues where you are not the player, is you do that in collaboration with others. So we are a member of the [sustainable organisation group], and other organisations, but that is a safe collaborative space to drive change in supply chains. Their vision is to deliver a thriving, sustainable farming environment that is resilient to change, that protects the environment, ensures human rights and animal welfare. So with those as the aims, we can then work with other businesses on key challenges, where some of them are not our major priorities, so fixing the orange supply chain, in the [southern] Spain, a wonderful environmental, nature part, that has a major water challenge, so the [sustainable organisation] is working with a number of key businesses, not [our organisation name], to run a project there to help farmers to drive water efficiency, and to drive improvement and to derive water management, so that we are having less impact on the [Southern Spain] water-shed. Because it is affecting that huge natural beauty area.

What we do in terms of water, for our key areas, for something like rice, we are sourcing basmati rice in Pakistan, we are working directly with farmers there to help them improve their yield, but also address the water challenges they are facing which is a hugely water stressed region. So we are finding ways to reduce water on the farm, and also helping the farmer increase his yield, because if he increases his yield, he increases his income, if he increases income his family has a better life, his children go to school, and there is greater gender equality. So, water, addressing water, is a wonderful catalyst for improving other things, but the reality of the UK Supply chain, doesn't have the same level of priority or challenges as many other areas in the world. So, we will work on those things in the UK, and [institute for agriculture] is one of your sponsors, and [institute for agriculture] work with the [research institute], and we work with [institute for agriculture] in various areas directly with [name of our company] in other spaces. If we were running a project, we would do it in collaboration with others, but our focus at the moment is on ten key raw materials and the places in the world where those materials are a major challenge. And if I look at my raw material of challenge, the UK priorities for my ten raw materials are probably, sugar beet and maybe dairy, because I buy some percentage of those. Of my other raw materials, like fish and mint and rice, my UK percentage is in the low 0s so we are not doing a lot of work in those areas.

So looking at sugar beet as an example, it is a great crop, it is grown well in the UK, we would do that in collaboration with other organisations. In Europe as an industry, as a sugar industry, we are using the SAI platforms – farm sustainability assessment model - for farmers to do a self evaluation of their own farm for broad sustainability, but water is one of those listed concerns.

The sugar beet industry in Europe is able to demonstrate that it has a higher sustainability threshold than many other sugar beet industries around the world.

What is the main issue with sugar beet?

There isn't a main issue, it is about helping the farmer understand, so farmers growing sugar beet in [Midlands] probably have more water challenges than sugar beet growers in the west, because that is the reality of the climate.

So it is about them looking at their farm, and asking do you have potable water for your farm workers, how do you manage waste, how do you manage... there is a stack of questions there. But sugar beet doesn't necessarily have a problem, but what it has done has got almost all the sugar beet farmers demonstrating that they are at a level of sustainability of silver or above. Then, it is just a threshold, if you answer these questions, you get bronze, if you answer more questions you get silver. And if you go further you get gold. So I am not sure there is a common problem with sugar beets, because you know, if you've got good soil versus bad soil, you'll use less fertiliser, you'll use less pesticides, and therefore have less eutrophication into the local water-shed. If you are farming more organically, you'll have different challenges. There is a great set of [South UK] farmers who are doing great work with cover cropping and drill planting as opposed to high tillage, and they are working with the waters agencies and the nature people to protect the rivers, so they are leaving good gaps at the side of their fields to manage runoff and that sort of thing. You have to deal with it on the ground, at the local level. You can go with generic challenges you can big scale the efficiency by doing 25 farms that have the same problem all at the same time, because generally farmers in the same region have roughly the same challenges, but it really does depend on the farm at the farm level and your ability to make change happen and that is driven by materia... [audio cuts out]

Hello again...

Would you be able to explain a little about the approaches to increase the resilience of the supply chain? You have been talking about what you do on the local level, but do you also look at increasing the range of suppliers you have, so that you don't depend on one region, or how do you manage these types of things?

I think the industry has recognised the opportunity of sustainability but with any raw materials there are only five things you can do. So if you have a particular problem, let's pick a generic one. Let's say child labour, exists in many supply chains and particularly in cocoa and the fish industry and farmers picking in the UK probably have labour they shouldn't use. So if you have, and you know there is child labour or any issue in your supply chain, you can buy from a different supplier. You can say supplier A has child labour in its supply chain and supplier B has been through a big process validating the supply chain, and has none. So the first thing you can do is move suppliers. The second thing you can do is use the same supplier but source from a different country. So you can buy from country A, and please only supply me from country A because you know country B has child labour issues in it. You can decide to buy something else, you can buy a different protein, you can choose to buy pea protein instead of soy protein, yeah if that is what you want to do, if your recipe can manage that if your quality of product copes with that. There will be a bigger cost with a bigger R&D element to that, but you can utilise another component, is the option. You can also stop buying. You can say, why will I make that product anymore, it probably won't go that way, but you can walk away from the market and close down. So the shifting you can do, and you see a lot of industry doing this now, is to vertically integrate the farm in some way. So the strategy is buy from someone else, from somewhere else, stop buying or buy the farm. And buying the farm doesn't mean that you own the farm, but you contract, with a longer term contract with that farmer, and then you can work with them over a longer period because you don't have that volatility of price any more. Or even go to the bank and get a longer term bank loan, because you have that capacity, that asset base to work with, and the bank will give them more money because they have a long term contract, because this company will work with me for 25 years if I can fix the problems on my farm.

We also recognise, and we're moving away from just buying commodities as commodities, and where you have problems you have to invest time and effort to do that, the way you mitigate some of those costs is that you spread, instead of paying for everything, we are going to pay over a longer period to give you the continuity and security that you need. What you see all organisation doing is flavours of that, depending on the criticality of the supply chain the level of the challenges, and some of them do that and they develop solutions in collaboration – because if you want to go fast you go by yourself, if you want to go far, you go with others.

You collaborate for scale.

Farmers in the UK have complained that they haven't been getting long term contracts with retailers meaning that they can only plan and calculate from year to year – and have to produce with a lot of uncertainty.

I can't really comment on that, as they are my customers. But some retailers are collaborating with farmers, with long term contracts. UK farming has been the whipping boy of retail. We don't pay enough money for water, we don't pay enough for milk. Farmers aren't being compensated for what it costs to grow a sheep or a cow or a field of peas. But the reality is that it is your fault and it is my fault. We are the consumers. And we will be happy to go into a shop and pay under £2 for a pint of milk. Happily.

SO the reality is that retail has to fix it. I do think retail has a role, but no, consumers need to behave differently and changing behaviours is the hardest thing in the world to do. So if you want to lobby the government – here is a thought – we should bring in a sustainability tax. Let's put 1 penny on every agricultural product in the UK so that all the retailers have the same problem, and nobody is showing that they are better than others, and make sure that money goes directly to the farmers. And then, over time reduce that tax, and make sure that retailers are, instead of going directly to the farmers, the retailers pay the farmers.

How do you manage the transition? Because the reality is that markets and brands want to show that they are better than others and cost is one of the key incentives of the consumer.

So if you want to get farmers who want to stay farmers, a thriving farm industry, you have to pay them a reasonable amount for what they do – to grow a cow, to grow a pint of milk. I can't believe we get away with paying so little for it.

Why do you think it is so difficult to make this happen?

Because we are in a market economy and the consumer doesn't care... you don't care enough to pay more for your milk. You walk into the shop that is going to sell it to you cheaper because you have different priorities. And when I say YOU, I mean you and ME. I am the same. I still buy my milk from the big Tesco store. I am not saying that Tesco is bad, but it's cheap milk.

Coming back to your strategies, what timeframes do you plan with?

One generation. So 30 to 50 years, 2050.

Are you able to plan as far into the future as you ideally would like to?

Absolutely. Businesses are really good at planning for about 18 months. 18 months is easy for us because we know to the penny what we are going to buy and what our processes are going to cost, and we know what our sales are going to be. We also, as businesses, are absolutely bloody amazing at 50 years. I can tell you what the market will look like, who will be in power, how much our sales will be, because it is 50 years away. It is a good guess, but we know that. What businesses are rubbish at, is 5 to 30 years, what academics are good at is 5 to 30 years.

So here is an opportunity. Businesses are in business to grow, and actually they are happy, particularly around sustainability, to collaborate and share. They also, about progress, are very practical people. Academics, and I don't mean this in any bad way, you are really good at that mid range stuff, but we are not going to involve you in our strategy thinking, and you can't make anything happen quick enough in the next 18 months. So, we don't have the same language, that is why I work with the [institute of sustainability], they provide that translation over the business needs. The other challenge is that you need to be unique, because you need to write the paper, to get the funding to write your next paper, so you need to be very unique in what you do, because you are selling your uniqueness, so collaboration is harder for you. Also you like to be perfect. You hate...

I often ask my business people, how perfect do you need to be to make a decision – and businesses are generally happy with 80% certainty. But academics need at least 100%. And the problem is, that last 20%, if you want to make a change to the choice you made, it is just going to add to the cost and delay taking action. So that is the challenge. Academics and businesses need to work together, but we have different priorities, and drivers, and we speak in different ways. So we need organisations like SAI platform, like CISL and there are many others, who can be the glue between the two, to bring that together. I am talking to MIT at the moment, they want to run some climate work, and they have an

amazing tool that can show you the error on their calculation. Plus or minus 5%. They can be really precise on how much error is in their numbers, it is really useful. But I am still happy to make a decision at 80%.

Personally, I will go to 60%, and if I really like you I will go to 42%. But it is about moving forward. Make progress. Get stuff done. The future is somewhere in the north, that can be everything within 180 degrees. Until you have done a lot of work you are less and less certain, but it is still generally not safe. So businesses want to get on with stuff. They want to make change happen, to get the issues out of the way and get on with growing their business.

So, SDGs are fantastic, but they were written by governments for governments, and they have been given to businesses to fix and to apply. Great, but there are 17 of them, we've already got 50 targets to just run our business. So some businesses just pick one or two to work on, and they will make great progress. But I look at them as local levers – and if I push that lever I can make a small difference, or if I push that lever I can make a big difference. But what I want to do is line them up exactly with 5 other levers – that is the way we have to work. We've got to get practical quickly. And you have to drive change. And yes lots of really really really really perfect science is wonderful, and I base everything I do on strong science, but if the answer is 100 or the answer is 80, I'm still going to go up that road, but I can get up that road quicker at 80. I can start helping people at 80%.

We have been using three different notions of resilience – robustness, recovery and re-orientation...

I think it is a mix. In terms of buying we have to change the business model, we have to buy with different priorities. People mainly buy commodities based on price. When we have short term contracts because you can move to better prices as quickly as you like. Well, that has to change – you have to get longer term contracts and prices will no longer be a key driver, certainly a consideration, but not a key driver. What I think is a key need for farmers, is that they need resilience in their business, so that they can take catastrophe, but have sufficient resources to still work, to still survive and to still feed their kids. So I think businesses have moved from just doing better, or just doing good, to doing what is right, so we recognise that we have to have resilient supply chains, and there are climate related or social related challenges that could be catastrophic to that, that we have to prepare for, but equally, we have to be sure that we are not causing some of those things as well. So, sustainability is a two way street, the industry has a vulnerability to climate change and a vulnerability in terms of the impact you have on climate change. The impact you have on water, the vulnerability to water, drought, flood. So you have to manage both, and I think businesses are generally accepting that it isn't good enough to just do your bits, because the industry has to change anyway, it's no good just doing enough, you have to do what is right. And that often means you have to go further than you thought.

Have you ever experienced a water-stress issue with any of the vegetables you use?

In the UK I don't see a big water stress issue. The impact a water-stress issue has on the commodity buyer is by pushing the price up. So volatility is the biggest challenge in business. If there is an upward trend on price you can plan it in and you can circumvent it. If it is generally trending you can be ready for it, but if it suddenly shoots up it can be a problem. I have seen examples out there, in the early nineties, because of the drive for biofuel, the price of corn in the US spiked beyond belief, and that put millions of dollars of cost onto business. But also the consequence of that is that people who grew corn for bread – there was shortage of food in the shops – because all the land was used to grow corn for fuel. So what water stress can do, it can slowly increase the price of the commodity. If there is a water disaster, if there is a flood, as well as a drought, the price will shoot up, and that volatility can be a real problem for business.

And more of a problem for the farmers who won't have any income. Let's be honest, there is a scale of issues here, any sort of water issue will drive volatility. Water-stress, if it is your priority area, there are only a few things you can do. If you have a very thirsty crop in a very water-stressed area – you've not only got to find a way to make that crop less thirsty, so put in drought resistant strains, or, find a way to add more water. Get governments to do rain water harvesting and other solutions to increase the volume of water in the first place. So what [our company] has done in the past, is that we have mapped the cocoa genome, and the rice genome, to manage pests, it's not about modifying the genome, it's about mapping it and saying that particular Y strain is more drought resistant – so if you are growing rice in a very drought prone area, and choose to grow that rice, you will at least have a crop. So science has been a great enabler, for managing water stress and challenges, but it is about mapping out the genome and choosing the right variety to grow.

How about in your processing factories?

So we have committed to reduce our water everywhere – whatever the right number for water impact on the world is for our business, we want to get at least half way there in the next twenty years. So there is a whole lot of water efficiency you do, and most of our water use in our factories is for air conditioning, cleaning and so on. You put in efficiencies to drive them down. Water doesn't cost enough... At least in the UK, for the price to be a driver for that activity, it's just something you do, if you can do it, get on with it. The price benefit in the grand scheme of things is not so big. We don't have the sort of challenges in our factories, as we are not big water users. But our most water stressed factory in the whole world is actually in the UK – because the requirement for water from everywhere else around it is very high. There isn't a lot of water to go around and everyone else needs it too.

An interesting discussion could be, if you have 1 litre of water left. Do you give it to school or a hospital? How do you prioritise it? The reality is that you can – you have to find another litre of water. You have to find other ways of getting more water into the system.

I've built factories, where I have made sure that water leaving the factory was cleaner than when it came in as a part of the deal of building a factory there. But you can as a business provide for a community a better water solution – because you naturally need to clean it for your process and make sure it is clean enough when it comes out. Most businesses leave it up to the municipality and the water companies to resolve it for them.

You can do that with all kinds of infrastructure – I have factories that have natural water processing, plants that take the water from the factory and make sure that it is clean enough so that it can be used to irrigate the land of the farmer next door.

There are natural ways of cleaning water – as well as industrial ways of chemically treating water and sewage.

Do you feel like local communities are open to cooperating?

They love it. It has nothing to do with it – we have nothing like big industrial things that make a lot of noise, it is just a nice lake type area or pond, and the plants process the water enough.

In Australia, our water is cleaner than the water people drink, but who wants to drink water that has come out of the back end of the factory. So we are not allowed to put it back into the watershed for drinking – but you can drink it. It is incredibly pure. But it comes from a source that...

No one has died in the UK because of a lack of water. I was speaking to a guy in Holland – and he was asking why no house in the UK is triple glazed.. when they are all triple glazed in Norway – because no one is dying – it isn't a big enough problem. Water is too cheap – we don't care about it enough – it is absolutely accessible everywhere – it is almost like, you just expect it to be there. When it starts to be more difficult that is when it will become an issue. The reality is, all conflict the most recent conflicts – including Syria – can be attributed to water – there was an interesting comment by Andrew Spear, who was head of the world water institute – and talked about the challenge of water – and that it was the instigator of many conflicts we have seen in the world. But that level of shortage in the UK yet, and I use the term as yet, very advisedly...

How were you able to convince your organisation to put in these water efficiency processes in place if it isn't cost-benefit.

We set targets up for the business over all. The trick was to buy into the concept over all. If you want to be this sort of business these are the consequences. It is about demonstrating the business benefit. And business benefit is about reputation. It's about the attraction of attention – If you have a great reputation and we are in the top 10 businesses in the world, and that is fantastic for a corporation of our size. That means more good people want to come and work for us. Can I put a dollar value to that? I can now, could I do it 5 years ago? Absolutely not. It's part of the incentive, but it is just the right thing to do, and you have to do what is right. And equally, you have to be careful about where you do it. You don't need to do it everywhere. But also can't just catch one fish. I have a water strategy for my factories here in the UK, strategies, technologies, to help minimise their risks, it's simply good business. None of this is challenging, it is absolutely good business. If you don't get it fixed early, you'll have a bigger problem later.

The guilt and fear thing, that was done in the late eighties, and we are past that, now it is about business opportunity. Business benefit, business return. If you keep banging the climate doom drum – we'll get bored with that. We need to bang the – how do we get the climate saved drum.

And make it a business incentive – not a business tax. To change the conversation. To change the behaviour, you have to change the conversation. We are fully behind it. We stood up and told Trump to stick to the Paris accord – and we were one of the few businesses that did that and I am very proud.

We accept the science – so need to just crack on and do it now – stop telling us that we haven't done it yet, it is going to take a while.

END OF TRANSCRIPT

Interview Transcript #8 – Scottish producer of vegetables and salads

November 2018

0:00

Introductory small talk.

1:05

T: Are you happy with me to record the interview so I can transcribe it later on?

S: I'm sure it's ok, yeah.

T: Great, thanks. To start off, would you be able to explain what your company does and with what kind of fruit and vegetables you work?

S: Yeah. Well we would mainly grow salads. We're different companies, we're [*flower company*] and [*salad company*]. [*Salad company*] would grow indoor salads. We used to grow a lot of outdoor salads but it wasn't feasible anymore, so we had to stop there. We grow cut flowers indoors and outdoors. We supply most of the main retailers right there. Salads we supply mostly to North Ireland. You know the retailers and the flowers we would supply over Ireland and the UK.

T: Why wasn't it feasible anymore to grow salads outside?

S: The wages were going up without the customers being able to pay us some more money. Whenever there are wages starting to go up, the cost has to, too. So have to make profits with it, you just don't do it for the fun of it. So, we were told, these wages are going up, it's going to become unprofitable, and the set-up is not going to support us so we said it's ok, we will have to stop there.

T: Ok. And indoor growing is less labour intensive?

S: Indoor growing would probably be a bit less labour intensive. But the other thing about it is it's less, not that it's less of a challenge, but it's more guaranteed. The climate conditions we have here, of just that crop, whenever you plan to grow in Northern Ireland it's not guaranteed that what you plant is what you're going to pick.

T: Which other businesses or organisations do you work most with?

S: Our customers?

T: Yeah.

S: Well our customers would be Tesco, Sainsburys, Asda, Spar, Lidl, Marks and Spencer's, I suppose some of the wholesalers as well and some of the small shops would get offers as well.

T: And then who do you buy from? In terms of, do you breed your own seeds, or do you buy them in?

S: Yeah, yeah we do. We grow everything ourselves. Flowers we would probably just buy bulbs. We buy bulbs from Holland, for the cut flowers from Holland. But for the salads we do everything ourselves, not the seeds, we would buy the seeds in of course, but everything else we do here. So we can get our peat here and the feed brought in.

T: So, which other businesses would you say affect your operations the most?

S: Well, what would affect our operations? We find that the Dutch would affect our operations a lot because they're good at developing seeds. They need to do a good job with

the seeds and the bulbs, that affects our businesses directly. If they just send you something that's not good, it's going to affect what you produce a lot.

T: And in terms of your salad growing?

S: For the salads, again, it's the seeds. We depend on a variety of seeds and I can't say that, but the problems with disease in salads today is that most of the diseases must come with bad seeds from across the continent. It really can't come from other people you know, there's not much of a crossover between growers, because we're so spread out now, so the only way diseases can come in is through the seeds, that is a real challenge because diseases affect a lot of crops.

6:16

T: Ok. And are you fairly dependent on the retailers in terms of their price setting or is that a fair negotiation?

S: Yes. There is no negotiation. A negotiation is when you come to an agreement at the end. I suppose whatever you say is that there is such a price and then you take it or leave it, I suppose there isn't much negotiation in that. So, whenever you are in the situation of taking it or leaving it, it makes it very hard.

T: So, the feasibility of your business is fairly dependent...

[CALL DROPS, CALL AGAIN]

T: I just lost you there.

S: An alarm started off, sorry. But no, negotiation is a tricky one with the retailers. Because, it's kind of, we're not small or anything, but they can still tell us to take it or leave it and so we have to take it. And if we find out it's not feasible, we have to leave it and cut back. So that's what we had to do with the outdoor crops.

T: Have you tried any other way of selling produce like on a farmer's market or something like that?

S: It's not consistent. We need what we produce to be consistent every day, so whenever you're used to doing that and have programmed for this, it's very hard to go for something that is alien to you by going to farmer's markets. There's only one happening here. It's hard to get a farmer's market that draws enough people in. Here you only sell two or three boxes, compared to what we're doing we're selling three, four thousand boxes.

8:37

T: So, focusing on water, what would you say are the main risks that affect your salad growing?

S: Well, I suppose this year's past, we're kind of lucky where we live, because we live by the lake. So, we're able to abstract the water from the lake. And the lake itself is enough here with a good strong water supply. The general quality of the water we have is not a big issue. Well, we have another greenhouse and the quality of the water there would be quite different. It's from a bore rail, and we have to treat it a lot. You know, you get it up to stack to be able to grow something. And so, we have one case with good water supply and another case where our water supply is - there's plenty of water, but it's a more difficult water, it's too high in some things and very, very low not nearly enough in other things and it costs a lot of money to treat it, as you'd say. You know with acid and putting an extra circulator in it to bounce it. What we have noticed with that water is, I suppose in one way is that to keep using it all the time on the soil makes the soil ungrowable, so nothing can grow

on it. So, we found out recently, we've only moved into this greenhouse for about 6 to 8 months and we found out that the water is a very touchy subject over here. Trying to get it right. So, we're still working on it. I'm assuming there would be people out there who would have the same sort of issues. We wouldn't have been aware of these issues until we've seen what's happening over here.

T: So, what are you doing about it?

S: We have to treat it. We have to get the water analysed, we have to put acid in it. Whereas at home we don't have to put any acid in it. So, in this water here we have to put acid in it to produce and put different grades of fertiliser in it, more specific fertiliser so that it balances the water out. The water is very good you know, it's lovely and clean, but it's less trendy to rock, it's not what's in it. Not much goodness in it.

T: And for the lake, do you need a licence to use that water or how does it work?

S: Yeah, we have a licence for that. So, we would extract with a licence. We also collect a good bit of water from the greenhouses, so it's the case that we don't need to take that much water from the lake. It's only during summer time, during the winter time we don't need to touch the lake water at all. So, it's only during the summer time that we use the lake and the river.

T: Ok. And that's a public lake or do you own that?

S: Yeah, it's a public lake, I suppose it's a private lake, there's somebody who does own it. But people are allowed to extract from it with a licence.

T: Ok, and have you been affected by flooding or too much rain or something like that?

S: Yeah, well, because we live so close to the lake, we live about half a mile from the lake. Where we live up it's near [location], it's definitely prone to flooding. It must have been three to four years ago where there was a lot of flooding. In our area, the lake actually rose up by a meter and a half, more than it actually should be. So, there was one of the greenhouses at the bottom that did get flooded. But the rest of the houses were ok. And generally where we live out it would be, you know there is flood lands down there beside where the lake is, so we're just used to that, we're just used to that. But what happened a few years ago, that was kind of an extreme event, it doesn't happen very often. Nobody trains you, nobody has lived to know or have seen that before.

T: So it was a very bad flood?

S: Yeah, it was a very bad flood, yeah.

T: Did you change anything in your infrastructure or flood management?

S: No. All we do now it's more in the wintertime when we're prone to get flooding. So the greenhouse which is more prone to flooding we harvest everything out of it before it comes to that stage. So, we get everything packed out of the house before it comes to that stage when we're expecting flooding. You know from probably November, December, January time on we should expect some flood.

T: And then by the time you plant in spring it's dried up again?

S: Yeah, yeah. It dries up in a few weeks, it just starts to dry up. Our water table is maybe half a meter below where we are now. So, the water goes away very quickly, and it's a very fast flowing lake. So, the water can get in and out of it very quickly, so it does take the water away very fast.

14:28

T: Have you had any issues with the drought this summer?

S: No. This was kind of learned over this last number of years. For the drought end of it, because we're again by the lake, the lake is kind of like our reservoir for when we're short of

water. It is a big lake, it's about 20 paces per mile, so we shouldn't run out of water. If we run out of water, it's because our pumps don't work because of some reason. So, drought hasn't been so hard, we haven't had any issues with drought. Now, there were other growers around us that had major problems. That ran out of water, didn't have enough water and so on and so on and they were having big issues. Trying to get water, because all our water we'd used up.

T: And they wouldn't have access to the lake?

S: No, they are further away. And actually, there's a farm beside us, and he's a dairy farmer. He would have cows. And his grass actually stopped growing during that really warm period during the summer. And again, that never happened in our country. So, he got a lot of our irrigation equipment and he started getting water onto his grass to see if he could get it to grow again. Because if he can't get the grass to grow the cows can't eat anything.

T: And did it work out?

S: Yeah. He says that it works. It worked to a certain extent, it just wasn't perfect. I think it was just so warm for the grass that it shut down, that's more of a bigger problem. Crops shutting down rather than drought. You know when it does get too warm, the crops shut down and stop growing. It's not like they will die or anything, but they will shut down completely.

T: So, do you have air conditioning in the greenhouses to regulate that?

S: No. We're actually ok. So, where we are, we're *[location in Scotland]* and where we are it doesn't get very warm. It barely gets 22, 23 degrees, that's like the limit of what temperature we would get during the summer time. And it wouldn't go off very long either. So, I would say our average temperature during the summer could be about average 16, 17 degrees. Whenever it's in the East of England it could be 30 or 31 degrees, it could be 18 with us or 19. So, in general the heat is not a big issue. It's not a justification to do anything special to try to get rid of it because you might only have that for a day or two. The houses now what we would do, it's only a small thing but we would probably white wash the houses if it does get warm. And white wash is like a chalky hemp, which we sort of spray on and it will reflect the sunlight coming at it. It does shade the greenhouse inside which cools it down.

18:02

T: How do you manage and plan for water scarcity in the future in terms of maintaining your licence, or increasing your water catchment or other things that you do?

S: We've looked at adding another water storage tank because the estate is so big now that we probably need another water storage tank and another pumping station. You know we do that so we can collect more water whenever it does rain. The licence we have we just keep it going, it serves for the next 20 years. So, that should be ok. As long as nothing changes, then, like I say most of the water we would collect off of the greenhouses that would be mostly enough for 9 or 10 months of the year. It's mostly the summertime where we need that bit of extra water. If we do build an extra storage tank, we won't need any river water at all.

T: Ok. How far do you plan into the future in general?

S: Planning in the future, well what we do now is, it should be trying to keep us under control, so planning into the future is kind of what you do now to set you in stone for a long, long time. It's not that what you're doing is enough for a couple of years, so what we have done now with the new pumping station, extra pump centre in case we do start to run out of water for extraction. The water will pump it around the greenhouses. It's another thing we'll

have upgraded that we need it to be to run the farm. For going forward in the future, we do other things, we do t-tip so we don't use as much water. We use mulch on top of the soil for growing crops and that again makes sure that you don't have as much evaporation, which means that you don't lose the water as much. Which means that you don't have to use as much water. And there's a few things we have that help with production and water usage.

T: So, the systems you have in place now will be good for the next few years? 5 or 10?

S: Yeah, I think they should be good for the next 20 or 30 years, they should keep us going. We probably will just need to replace the tank at some point, but in general it's good enough there now to keep us going for what we need. Because we tend to not have dry summers, and it's been good. It's worked well so during the standard year we normally do get rain, so this summer was very, very dry. And it's still even very dry at the moment but we do get rain. But this summer was very, very dry. And the land, the fellow next door where his grass stopped growing. And nobody even heard of that before. But there's a lot of people it happened to, not just him. But he wasn't too happy with it because he had to water the grass in the garden for three weeks.

T: Yeah, a lot of people had issues this summer, unexpectedly, and didn't really have mechanisms to cope with it. So, you're lucky with having the lake. In general you would say you are able to plan as far into the future as you would want to?

S: Yeah, we normally see the problems. As you go along, you see the problems. So, we've been working them down at a steady rate. We see we need more water, we get more water. We don't have enough pumping equipment there, so we need to get more pumping equipment. You know these short kinds of things, you do. You know that they're going to last for a long time when you have everything sorted out. The only thing we would see around the farm would be somewhat of a pipework might not be big enough. Well, the farm grew over these last 10 years, and the pipe work has nearly stayed the same size. So, what we probably have to do is update the pipework around the farm. You know that instead of using 60 and 70 mil pipes, we have to use 90 and 110 mil pipes, so that we have more of a water volume around the farm, just versus fresher.

T: What makes it difficult to expand that system?

S: Ah, everything is under the ground. So, we'd have to start digging up greenhouses and I suppose the cost of it would be a big thing as well. So, we have to sort of monitor what we're doing at the minute. What we have is probably ok. At the minute we probably have to water during hot times of the year for 24h a day. If we had a bigger pipe system, we would maybe only need water for 12h a day, because you would have more of a volume of water available to you. But it is, we were just growing and so on and so on with cost, but we also don't know what Brexit is going to do. We pretty much keep any money which we have, we nearly have to sit on it. And see what extra cost is going to be involved between Brexit and so on, because if there is going to be tie ups, what they're talking about. We know that our customers will not want to pay that, so someone will need to pay for it. And it's generally the supplier who has to pay for it.

24:04

T: Are there any other strategies to increase your resilience to water risks that you can think of? Things that you could be doing?

S: Anything we could be doing to increase it?

T: To have safer access to water?

S: So, what we have, everything we have around, we can get a lot of water with it in a short period of time. There's a few things that we might like to have automated a bit more. We

have a few things where we have semi-automated systems, and you'd have to go and check them to make sure everything's working and things like that and make sure everything's being watered. In general, the systems we have aren't so bad, the only bad state here is that there's a lot of greenhouses. It's not like in Holland where you have two or three big greenhouses you're working in, and all the different stages in it. Where we have maybe 30 greenhouses and each one has their own watering system in it, so you have 30 systems to manage instead of maybe one or two or three. So, a change like that, maybe we could say how do we come about that? And the only thing we can do in the next number of years is take down the smaller houses and build bigger houses. So, it's a case of what to do that for? Is it for watering systems, or economy of scale in the house? So, in a small house it costs nearly the same time, nearly you know, it probably costs more of an average of time than it would in a bigger house. In a bigger house you're not stopping so much on things, stopping and starting.

T: So what limits you to have bigger houses, or implement more automation?

S: Again, what we try to do with any profits will need to cover any greenhouses we got, so that would be it, whatever profits we have. We try not to go to the bank because you don't want to be sitting on someone else's hand with what you're doing. So that would limit me. So maybe we would have a bad year that would restrict you in what you can do. But then the next year might be a good year and you could say we'll build a new greenhouse, take away an old one. Things like that. Pretty much that would be the big thing. And of course, if your price drops. That's what we noticed in the last years. Our price drops. Four, five years ago, it was far better than what we're getting for our produce now. Yet all our costs went up so that means our profits would be done. And we're just hoping our profits won't go down further because that wouldn't be feasible. Again, to do anything. So, we're always doing it to not get into situations where profits drop that low, we're trying to get out of a hole. So, knowing when to stop is the key thing of doing what we're doing.

27:50

T: Do you know why the prices have dropped so much?

S: Well, the prices drop because our customers want to keep inflation down. So, if you are going into retail, you go into a shop and can buy a round lettuce for 40p, five years ago, a round lettuce was 60, 70, 80p in the shop. So, the sort of drive down for inflation, we have to say the only good thing is they're taking a lot of that cost on themselves. We're not too sure why they want to do that, but they talk about getting people through the door. So, don't know. It's a funny situation to be in at the minute with the retailers.

T: So, in a hypothetical situation where the water-related risks would go beyond what you have planned for, what do you think would happen in the short term and in the long term? So maybe you lose your licence to access the lake or there's not enough water, what do you think would happen?

S: First thing, as the licence, if we lost the licence, you would have to build more storage. Water, it's not as if we were in an area that is prone to getting drought. We would actually be the opposite. So, what we would have to do is store more water so that would solve the problem, short term. That would be the main thing to do, is store more water. Again, where we live out, they say that you can't really drop a bore hole into the ground, so you would have to get an abstraction licence for something like that. I don't know, hopefully we'll never have to cross that bridge. I don't know, it's a hard question to have an answer to. There's a chance we'll never be in that problem. If this was a real problem, it would close you. We could do without a few things, but definitely water is one of the things you can't do without.

T: Could you also switch to growing other vegetables that need less water, or wouldn't that be feasible?

S: Of the things that need less water, there's not that much out there now, unless you got cereal or something like that. You know we are nearly braced for that. But nearly all the crops you would go to would also need a lot of water. The only thing you could do would be to manage it better, which we would be doing. We would monitor it by putting spikes in the soil to see what the moisture is like, so we just wouldn't go and water a crop that is not in need. We wouldn't go water that, we would go check it first to see if it needs any water. So with soil also, it depends on how hot the water is, too. Hot enough so that it pours into the soil and to keep a percentage of moisture in the soil. In general, we would probably be doing better now than a few years ago with knowing what water to put on and what the plants need. So that's what we could be doing. We use less water now than what we did 10 years ago, yet our farm is nearly twice the size.

T: Impressive, well done! And thinking about the fruit and vegetable supply system as a whole, so not only your farm but also other farms and processors and people who wash the salads and everything, what do you think could be changed to increase the resilience to water-risks overall?

S: Well, most of them people now would have I'd say, nearly all of them would have systems in place to recycle the water they have. I know most of them guys who are doing washed charges and stuff like that, they have recycling plants and things like that. Wash again with what they have, even the fruits and traders there, they do a lot of coleslaws and things for Marks and Spencer's they use a lot less water than a number years ago, because they're recycling and sterilising a lot of the water they have. Because water is becoming quite expensive now. So, if you can sterilise it and use it over again, you're saving yourself. There's a planner who raises plans and he used to take off the water from the mains for irrigation, but he now put in water storage tanks. So there's a lot of people out there who are looking at what they are doing. Because water is one of the things now that gets people charging for a lot more. But again, and this country is one of the things where there's not that much of a shortage of water. If you're not set up for using water, like the potato man who never had an irrigation system because he's never needed one. So whenever they need these things, they put a system in place to better use water. It's whenever you don't have it and you don't have a system in place, those are the people with problems.

T: So, you feel like people are already doing a lot to improve water management?

S: Yes. Lots that you can do, those who have needed to use it, a lot of people have water systems in place. There's the ones who don't have it and they're probably a little bit more inefficient because they don't have a system but they use water. And so they would usually use the public services. As the need and, definitely whenever there's a cost on it, people would have very efficient systems whenever there is a cost on the water. So just like us, like ourselves, we have done it and monitored water more. It's not like we have a shortage of water, we don't have a shortage, but it's just that if we monitor it better, we get better crops. If we put too much water on or not enough water than a plant wants, then the crops stop growing. So what we do is monitor the crops so that we give that water to them when they need it.

35:50

T: Can you think of any practices for yourself or other people in the supply chain that shouldn't be changed?

S: That shouldn't be changed`

T: Yes.

S: I'm not too sure. I know what to say. No, I don't know anything that shouldn't be changed from a bad, from a good point of view. People in general should watch more what they're doing with regards to how much water they put on. That's something that probably should be changed which is probably a bad thing. People get some sense of a wee bit more. You know that. We would study things, see what others are doing, you know from there, you go away and learn a wee bit more. That's what we need a bit more, go away and learn from what others are doing. There's people who are more prone to drought than we are, but they can grow better crops so that's one of the things where they are watching a bit more what water they're putting on and things. But to change what we're doing, you can always make things better, but whenever they are good, you don't really want to take away from that.

T: Yeah. And do you think there might be people who have a different view to you?

S: Yeah. There's always people out there who have a different view.

T: What do you think they would be saying?

S: Especially this year. There's some people who would be jealous if you are at a lake or something like that. You know, you wouldn't have the funny troubles that a person would have who is far away from a water source. And in our industry, you know, people always learn of each other. We would always chat and be at the forefront of learning things and doing things. Hopefully many people are learning from us versus criticising what we're doing. We're already very critical of ourselves more than other people criticising us.

T: Are there many farmers in Scotland who have access to lake water?

S: Not too sure, I'm sure there is.

T: Do you have to pay for that license and to use the water?

S: Well actually, no, we don't have to pay it. But we need a license for abstraction. There's some other people paying. For bore rails and stuff like that, but for us we don't have to pay for it.

T: So those were all the questions that I had. Do you have anything else on your mind or something that you would like to add?

S: No. Well, kind of the things that were asked, I think more than ever we know that water is a valuable source. You know, it's funny. It's one of the things that people need to be even more careful about what they're doing. Everybody was always careful with, you know, trying to not cause pollution and that kind of stuff. But the water is something our workers need to see, you can do without gas, you can do without a few things, but you can't do without water.

T: That's true.

S: People need to be even more careful what to do with the water, in particular somewhere where it doesn't rain very much. You know there, people realise how valuable water is. We will always take it that water is there for what you do. Everything falls under that.

T: And the UK is still in a lucky place compared to many other farming areas.

S: Yes, certainly. Yeah, I wouldn't like to be you know, somewhere real, real dry, some place. I don't know how to do it, I really don't know how to do it. But I suppose it depends on what the licenses are in those places, and on the groundwater storage and things like that.

Because I suppose that they have underground storage tanks and all... *[audio cutting out]*

41:30

Goodbye small talk, reminder for consent form.

Interview Transcript #9 – fruit producer in Northern Ireland

November 2018

0:00

Introductory Chat

1:10

I: Are you happy with me recording this call so I can go over it more easily later?

P: Yeah, go ahead.

I: To start with, would you be able to talk about what kind of fruit and vegetables you work with?

P: Strawberries, raspberries, blackberries and hobbles.

I: Which other businesses do you mainly work with?

P: I mainly work with strawberries.

I: Yeah, and who do you mainly sell them to and who do you supply from?

P: The wholesale market, [Northern Irish place], local shops. And there's some cash sales at the farm, but that's quite small.

I: So, a few direct sales as well?

P: Yeah.

I: Do you grow everything from scratch or do you buy in parts?

P: We buy in the plants. We used to raise the whole plants, but we buy the majority of the plants now. We buy in from Holland, some from England, but mostly from Holland.

I: Ok. Do you grow in greenhouses or on the field?

P: I grow them on garments and grow bags on table tops. It sort of came around growing on the ground, we would always grow on the ground in raised beds. But it's a bit of a narrow labour getting them picked. I suppose it's quicker getting them picked on the table top.

I: Which other businesses or organisations affect your operations most?

P: Mostly other farms, strawberries coming from Holland, competition. And [South of Ireland] would also be a competition. And then the local growers, too, obviously. Sterling can sometimes, depending on how that is, can do something. But people very generally prefer local strawberries. Close to the supplier.

I: So that's good for you. Are the strawberries from abroad usually cheaper than what you can grow?

P: Not always, but sometimes there could be a flood, there could be a flood of strawberries that they can't sell in Holland. And there's a flood that comes in through [Northern Ireland] and that could be very cheap and out buy local strawberries on the wholesale market. But the price does fluctuate. There's times when the price is good, but it fluctuates according to the season, the weather and demand.

4:42

I: Do you use a lot of water to grow the fruit?

P: I suppose for irrigation. It's drip irrigation that I use, it's fairly incorporated, it's injected into the water system. So, we need to get water in the rail.

I: So, what would you consider the main water-risks that affect you?

P: It was difficult this year, getting enough water because it was such a hot, warm spell. The plants were getting stressed at times. I wouldn't be up to, I'm not one of the top growers, I'm just a standard grower.

I: And where do you get your water from?

P: Off mains, but I also collect water in tanks, rain water. But most of it would be mains actually.

I: OK. Is that very costly?

P: Yeah, there is a certain cost there. You know, you have to watch that too, you can't afford to waste it.

I: Have you been affected at all by floods or heavy rains?

P: Not this year, but I have been in the past. Of course, more when I was still growing on the ground, plants lost due to flooding. But not much now, not really.

I: Was that one of the reasons for you to change what you grow?

P: Yeah, one of the reasons, but the main reasons would really be the picking.

I: Would you have any problems with diseases coming through the water system?

P: Diseases? I'm not sure, the water should be personal water, suitable for drinking. So, I suppose if it's drawn off a river into the net, there might be something in it, but I'm not 100% sure. I know I have to add acid to the water because it's too hard. So, the PH in the water has to be about 6.4 or 6.5. So, I do add acid to the water in the feed tanks.

I: And the water that you collect, do you treat that?

P: No, it's ok. The quality is good. I use the water I collect also for spraying. It's such a soft water, the rain water. There's not any coverage.

I: Based on the drought you have experienced this summer, are you planning to make any changes regarding your water management?

P: Yeah, I'm not there yet but thinking about getting a bore rail, get a license. I have to look into that.

I: Would that be fairly expensive to do? What would be the difficulty of doing that?

P: Just cost, I suppose. I guess we need to look into it because I'm sure water is not going to get any cheaper. This survey that you're doing is part of your coursework? It's for university?

I: It's a larger research project about global food security and the UK. It's a project by Cranfield University and Oxford University.

P: Right, ok.

I: So, we will be writing some academic papers with the information. We talk to a lot of farmers and also food processors and retailers and look at what kinds of challenges they are facing in terms of water management.

P: Yeah, ok.

I: Ok. So, aside from the bore hole, are there any other strategies for water management that you have been considering?

P: Just rain harvesting. On the greenhouses. And looking into a bore rail. At the moment that's really all, I'm using the mains water as well.

10:50

I: And for irrigation, you're already using a pretty new system, or could you improve on that as well?

P: Sorry?

I: The irrigation system, the drip system that you're using, is that already very efficient or could you upgrade that as well?

P: I would like to upgrade it, would like to. But it's just the costs.

I: So, you mainly have to watch the costs.

P: Yeah.

I: And how long do you plan into the future for your business?

P: How far in the future do I plan? I don't look far enough ahead I think, but three years ahead, there's always the next year, obviously. But three years. I suppose I should be looking further into the future.

I: What prevents you from planning further ahead?

P: I'm saying I usually only plan three years, or one year, two years into the future. Whereas I should be looking further into the future. But I don't get a lot of help in and out from the government. I know several complexes in the South of Holland and the South of Ireland do get a lot of help from the government. Get grant help and all, but we've had a bit of a loss in the North bound here, it's just bad loans and all.

I: What kind of help would you like to get from the government?

P: Advice for a start, agronomy help. Financial help would be good, too.

I: So, it's mainly the financial aspect that doesn't let you plan further ahead?

P: Yeah, probably.

13:35

I: Ok. If you think of the fruit and vegetable system as a whole, also other farmers and food processors and all of that, what do you think could be changed in general to increase the resilience to water risks?

P: That's a good question. What could be done to improve it? Some grants for putting in bore rails might help. I'm sure there's more that could be done to improve the efficiency of the water. I may not be a good help to you.

I: No, no. It's fine, this has been good! So, in a hypothetical situation if you would not have enough water in the future or couldn't have access, what do you think would be happening?

P: I would probably need a bore rail. If that wasn't the case, you would just have to walk away, get a job. Because you do need water for growing. Simple as that. You do need a good water source.

I: Is there any opportunity in breeding strawberries or other berries that need less water or something like that?

P: Well it's possible and I don't know if it may be worth considering. The Dutchman is well ahead of the Irishman. He uses water, the bags are grown in troths, and then the water is caught, recycled and filtered and is used all over again. That reduced quite a lot of water. Obviously, it needs to be topped up but it saves quite a lot of water. There's recycling if you understand.

I: Why do you think farmers in Ireland don't do that yet?

P: Well in the North of Ireland I don't know anybody in strawberries doing it. In Holland I know they are doing it and some people in South Ireland are doing it, too. It's because our farms are not as supported by the government. There's more of a push in Holland to produce local strawberries and tomatoes and all the rest. The horticulture industry in this country is not really supported, I think beef is more supported, it is actually. But it's just the way it is.

I: Maybe it's also because you get more rain...do you get a fair amount of rain?

P: Well, not this summer, but in general one does, yeah. In summer with harvesting the rainwater you could recycle it. That's what we are also doing, harvesting rainwater from the gutter of the greenhouses.

I: Ok. So, I think those were most of the questions that we have.

P: Yeah.

I: Thank you for sharing. Do you have any other thoughts that you had on water management or how to be more resilient in farming?

P: I know some of the Dutch growers are using coir, growing in coir as opposed to pit.

I: What is coir?

P: Coir is coconut fibre. It's used as a substrate and hardly don't need to use as much water for that for some reason or other. But I don't really know what else.

I: What do you do outside of the strawberry season, do you grow something else then?

P: Years ago, we had devisables but I haven't been growing them in years. And this year I'm thinking of getting a part time job, driving. It's hard to find, I have no income in the wintertime on the farm. It's just maintenance.

I: That must be quite difficult.

P: Yeah, it is. That's the downside of it. But farming is still my main business. You just have to get on with it.

I: Well, then good luck during the wintertime. Thanks for taking the time to talk to me today.

P: Not at all. I'm glad we got it done eventually. I hope you got enough information out of it.

Bye bye chit chat. Consent form reminder.

Interview 10 with a Regional Environmental Association group

Our work looks at what the risks are from different agricultural practices of contaminating watercourses that may or may not be used for a variety of purposes, and one purpose of course could be for irrigation, which could be a risk for some ready to eat crops.

Of course, there are also areas that we will regulate that will have an impact on the water environment, particularly if they are not meeting the requirements of existing legislation. Of course, there are sewage treatment works and there is legislation for sewage and organic effluent and indeed effluence from other trades that discharge.

Perhaps you can tell me a little about what it means to be a [edited job title] policy officer, and then a bit about your work around diffuse pollution.

So, I am a policy officer with [organisation name] on land issues, so that effectively means that within [our organisation name] I have a responsibility for the way we as an organisation regulate and provide advice to the land based sectors, which is primarily agriculture and forestry, and things like moorelands. But agriculture tends to be our main work area on land policy issues, simply because there is so much of it. About 75% of Scotland is agricultural land. There is a direct relationship between the intensity of agriculture and risks to water quality.

Of that 75% do you know what portion is for livestock, arable and fruit and vegetables?

I can only give you some very general qualitative info on that, but it is all readily available online. But I can tell you that compared to England there is a far greater proportion of grazing land. And you know, for agricultural land it is going to be the vast majority, for livestock purposes, and I will have to get this figure verified, there is a low amount of arable land, perhaps in the order of 10% or so.

Are you able to tell me about the pollution you work with? Where does it come from, what is it, how do you measure it, for example?

So from the diffuse pollution side of things, anything that will downgrade water quality as per the WFD, where all watercourses are defined by their ecological status and targets, within the EU member-states to meet good water quality. So for Scotland the target is that by 2027, around 97% of watercourses need to meet good water quality. In Scotland, it is only about 68%, so it is a target to improve water quality. So if you look at the reasons that only 68% of water courses are meeting good water quality, we find that a substantial amount is due to diffuse pollution from agriculture. That can include things from the likes of fertilisers, nitrate and phosphate getting into watercourses, it can include pesticides and of course, and I think this is particularly relevant to yourself, it can include what we can call faecal indicator organisms, bacteria and other microorganisms from things like organic materials, and other substances. Maybe it has less of a risk to the food sector side of things, but nevertheless important pollutants. Another example is of course soil, which gets into watercourses, which can kill fish. So these are some of the main pollutants that we find as issues here in Scotland, and so we are trying to have better control of them. Because of that we have regulations here in Scotland, governing how agriculture is carried out. Because diffuse pollution, by its nature, the cumulative effect of many farms contributing very little pollution had a very significant impact on water quality.

How do you manage interventions around diffuse pollution?

We will have as per the WFD, [our organisation name] carries out monitoring and reports back to the EU commission. So under things like the Nitrate Directive, we will measure nitrate in boreholes and surface water – so groundwater and surface water is covered. Our network will look at high risk areas. For some of the other materials that can get into river courses, we will have regular monitoring points. And of course, as an organisation, which has a 24/7 service so if there is a pollution event we will investigate it and enforce any actions of the farmers there. So just like in other parts of the UK, just to add to that, I think it is particularly well done in Scotland and the research organisations here, there has been substantial amounts of research done looking at where some pollutants are coming from. So how much nitrate is coming from agriculture, it's lots, by far the highest proportion. How much of that, for any given catchment, where does the phosphate come from. And that can be a bit complicated because you can get phosphates from soap powders and so on. So for different catchments we have a good feel for which different pollutants are coming from agriculture, or sewage treatment. And we have gotten these from a variety of research organisations including the James Hutton Institute, ADAS and some of the universities here. And from research we have a good feel for the different management practices at farm level, what are the risks and impacts of materials getting into watercourses. So researchers will have information that allows them to model for different scenarios, showing that if farms apply X amount of cattle slurry at this time of year how much material is leached into the watercourses. So based on these studies in Scotland, we have now had them since 2011, so our legislation came in a lot earlier than the legislation in England which only came into force this year. And we are currently having a discussion about introducing new diffuse pollution rules. But we have had them in Scotland a lot longer anyway. And based on some of the research, we have got what we call general binding rules (GBRs) that cover a whole host of activities that farmers carry out. So that includes things like fertiliser application and storage, making sure fertilisers and slurries are stored properly and not spread out in poor conditions, and not spread too close to water course and making sure that farmers don't apply too much of it.

We have also got rules on keeping livestock, which can be an important source of FIOs and reducing the amount of compaction of livestock close to points of water – to prevent faecal material getting into water.

And then there are rules about pesticides, how you prepare it, clean and maintain the sprayers, to prevent spills and run off from washing and getting into watercourses. Things like sheep dip, which is effectively a pesticide, also have rules applied as well as other things that go on around the farm.

So we have these rules in place, based on what is best agricultural practice and sound science, but not all farmers were following these rules. So we have to go out and give farmers advice on these rules. And we found positive changes on farmers as a result of visits, but I can say quite confidently that 4-5 years ago not enough farmers were following these rules, despite being mandatory regulations. And this reflected that general lack of awareness there within the farming community, and as a result a significant amount of watercourse were put at risk. 2015, for example, we knew that about 400 watercourses across Scotland had significant amounts of diffuse pollution there. So most of these watercourses were rivers but there were also some 35 lakes and about 40 ground water sources were receiving significant amounts of diffuse pollution. So that is quite important for us, because that is obviously important for rivers as this can be used for irrigation, particularly in the East of Scotland, but there are other human health risks too as these can be used as bathing waters where people could be at risk, and shellfish water and drinking water areas and so on.

How is it that you managed to get the farmers on board?

So it was a major piece of work. We looked at 14 priority catchments, so where there was a human health risk, water used as drinking water, bathing water or water that they use for shellfish fisheries. These were particular areas of rivers of importance where we focused our first phase of work. To give you an example, [our organisation name] staff walked all the water courses in these catchments over a couple of years. Just under 6000km were walked by [our organisation name], and what they found was that there were over 5000 non-compliances of diffuse pollution general rules, and other pollutant issues. So in other words, for every kilometre we walked we found one farm not complying with the regulations. The most common area of non-compliance was the keeping of livestock, getting too close to the watercourses, causing compaction, faecal matter getting into the water raising the level of bacteria in the water. Another factor was the cultivation of land, with soil getting into watercourses, and similarly we found problems with fertilisers getting into the water, organic and inorganic fertilisers. We found that there was a bit of a range between different catchments. But basically, when we visited the farms in more detail, we found that a very high proportion of farmers were having problems with livestock pollution. So our rules say that if you keep livestock you must prevent significant erosion or encroaching on any land within 5m of surface water, or spring, or any water used for human consumption. Boreholes or wells must also be capped.

We actually found that 75% of the non-compliances had to do with livestock being too close to the water courses. So, what we would do is advise the farmers of the rules, try to direct them to any grants that would be available to help improve the farm. But giving them very clear advice in the way that the farmer could do to rectify it. By the second visit, and this is over 3000 farm visits. We went from 15% being non-compliant to the general binding rules, when we got to the second visit, giving the farmer a fair amount of time to sort out, we agreed a time for when we would be back, I think it is crucial that they were aware of when we would be coming back to inspect it. When we came back we then found that about 85% had met the rules or were very close to meeting the rules.

It has been very successful.

We have found this technique a lot more successful. In the past we would send farmers letters that weren't really farmer friendly in terms of being able to understand. We would be going through the regulations there in a rather legalistic way. But this time it is explaining clearly, from their perspective, on the farm and then following up in writing.

I will just say that the 15% figure I gave you was with respect to the worst catchment, the overall average was 35%, when we went out for the first inspection, so that is 3000 farms, we found that 35% were meeting the general binding rules...

Can you tell me more about the relationship between farmers and the government and how that has helped improve the situation?

We have tried to work a lot closer with the sector, than we have in the past, particularly with organisations like the National Farmers Union here in Scotland and the farmers themselves, as well as some of the lead agricultural researchers here.

We only want to give out advice and policies to farmers that are based on sound science, so we did get a considerable amount of research on this issue commissioned and carried out an assessment of farms beforehand so we had the evidence to approach the NFU and the farmers themselves. But also as a particular policy, what we decided, as an organisation, to do was – our first visit was an advisory visit. We didn't go down the route of prosecuting farmers if they were causing problems and that helped us get the farming community on board – giving advice on what the regulations were. We could have gone down the prosecuting route for serious pollution or we could have given fixed

penalties but the first visit was very much an advisory visit. Meeting the farmer, discussing with them, walking around the farm with them, pointing out things that could be improved or that were required to be improved. Making an agreement with them for when we could come back based on their time scale as a farmer to rectify that. And we saw farmers implementing measures that they require on farms, so for example farmers started to fence off watercourse, preventing animals from getting in.

Putting in water troughs and things like guttering and profiling of yards to keep clean water clean and minimise the amount of dirty water produced, which would reduce the amount of slurry storage required.

A significant amount of livestock farmers didn't have enough slurry storage which is so important because if a farmer has enough storage, it means that slurry can spread when conditions aren't appropriate, when soil is wet for example, or when rain is forecast. So if we can get farms more slurry storage that can improve the way livestock manure is used on farms.

Did you also participate in visiting the farmers?

I have in the dim distant past, but my job role has changed so I haven't been out to the farms, in my early career with the farm assessments I did, but being involved with policy I really get out unfortunately.

Do you have any examples of a positive transformation where meeting the regulations has presented a significant challenge? Where there might have been a trade-off that had to be managed?

What we have tried to look on and work with farmers, has been at least in the long term in the farmers benefit. For example the diffuse pollution rules will certainly result in less nutrients being lost from the farm, from organic or inorganic fertiliser. And it is almost changing the way the farmers think about the animal manures – not just a waste to be disposed of as cheaply and easily as possible, but as a resource that can be utilised. Given the economic situation in farming, it is very much in the farmers' interest to be using organic manures properly. So giving them advice on the value of organic manures, allowing them to reduce their inorganic fertiliser which is very expensive and has gone up in price.

And things like reducing soil erosion, while in the short term farmers might not appreciate the impacts of losing a relatively little amount of soil, but in the longer term we would remind them that when passing the farm on to the son or daughter, after 40 or 50 years of soil erosion, you've got a much poorer quality of soil there. So, although there are some trade-offs in many cases what is good for the environment is also good for long term agricultural productivity as well. So it is focusing on that.

And for things like keeping livestock out of watercourses, that is actually quite a good thing from the point of view of bio-security which is a big issue in the UK, with climate change, and the risk of diseases in Scotland and parts of England. 20 years ago, we had foot-in-mouth in some areas. Farmers they're aware of that and are beginning to see that if they are putting animals near the water then that could move about, or animals could be drinking water that is contaminated from upstream. There is almost a bit of peer pressure amongst farmers to improve how they are operating. So we were pointing out many of the rules, they are in farming's interest to follow them and although there might be some trade-offs in following these rules, for example, putting in slurry stores would be a major cost for some farmers. But in some cases we were able to work with the Scottish government in catchments that were particularly susceptible to pollution and make grants available to farmers, we wouldn't get the full cost, but we would get the grant for say about 40% and get that slurry storage in place there anyway. It wasn't new money for farmers but they just changed the focus of what grants would be available to farmers, available in the targeted areas.

In addition to that, we would look at less costly techniques for reducing the amount of slurry that was required to be stored. So making sure that things like guttering was fixed on farms and what that meant was that roof water could be disposed of into clean water areas and not get into the slurry store and use that all up.

But for a lot of farms, and what we saw a lot ten years ago, and rarely see now, things like ring feeders – rings of steel 2 or 3 meters in diameter with straw inside for the animals – were placed quite close to the watercourse. Farmers thought that it was good that animals could eat and drink at the same time. But we have rules saying that they must be at least 10m away from the watercourse – so actually it doesn't cost the farmer anything to move it. But, that particular farmer was just unaware that that was the rule. So to move it, that is a quick and easy job that doesn't cost anything and gives a buffer preventing faecal matter getting into the watercourse.

Something that I have come to understand here in England is that there is often a difference between landowners and farmers in the form of contract farming. This brings challenges to the idea of stewardship over the land. I feel from what you have been saying that this is slightly different in Scotland, can you say a little bit about why that might be?

I don't know how figures compare. I think that type of practice is more common within the intensive vegetable industry for things like potatoes and some of the other crops, but generally overall there is less in Scotland. What you are describing may happen on some farms but I think it is less common in Scotland although it does occur. But what you have said is absolutely fair, I'm afraid I don't have a figure for how many farms but my seat of the pants view is that there would be a lower proportion of farms that work on that basis, with limited contracts one year and then moving on to another farm. But I completely agree with that feedback you have given me. When you work in that scenario then there are increased risks of poor stewardship and less view on the long term picture. So I think that when you have farmers who work on a long term tenancy or where the farm goes to another family member when they retire or farmers who own their land, that gives them a far better stewardship view. It allows them to see the connections with the wider countryside around them. So we found that when we have been out and advised on diffuse pollution in the South West of Scotland, where many of our bathing waters are, we've pointed out to farmers who might say be 50 miles away from the coast, we have pointed out that that very small stream on their land goes out into that bigger stream and then that goes into another stream and then that goes to the river and that goes out next to the bathing beach. Therefore, what you do next to the water, if that is getting into that almost like a ditch, that is ultimately getting into where people are bathing. So pointing out these connections to them, and often you know, farmers, particularly on a catchment basis we can show the connections there and even though they might be 15 miles from the beach they might well have a cousin or a sister who owns a bed and breakfast there and anything that is bad for tourism could be bad for someone he knows. So I think it is explaining to them the impacts of farming activities under their local areas, and I think that if you have someone there that is effectively farming there permanently then it is far easier to demonstrate how things are connected together in some of the risks there with poor farming practices.

Are there any intergovernmental platforms for sharing experiences and approaches between [our organisation name], [environmental organisation in Wales] and [environmental organisation in England]?

We do have discussions with colleagues in [environmental organisation in Wales] and [environmental organisation in England] and share experiences but there is no high level group. We used to have these sorts of things but as the situation is now juggling so many things there are less of these high level

groups to discuss and share experiences. But I sit in some groups on wider issues with [environmental organisation in Wales] and [environmental organisation in England] and we do occasionally talk about it and there are conferences so everyone is aware of the work that we have been carrying out.

I understand that the [waste organisation] shapes a lot of your work and your reporting will last up to 2027, is that the cut off at this point for looking at outcomes of policy or are you already starting to look beyond that in terms of ambitions for water and the environment?

I think it is there as a date just because there are requirements from the European community and the river-basin management planning cycle, and I think that these are reasonable dates to work to. Politically in Scotland, obviously the legislation is Scottish and doesn't come through the Westminster parliament, and our minister of agriculture is cabinet secretary of the environment land reform and climate change, and she has made a commitment, regardless of what happens with BREXIT, because the environmental rules are absolutely right for Scotland, and she has made a commitment that Scotland will still follow them. It is good for Scotland economically, as well as environmentally because we as a country promote ourselves in a clean environment, and of course it is not clean all over the place, but we have got to safeguard and support the expansion of businesses that depend on a high quality water environment. That includes tourism, fisheries, whisky production and so on and so forth.

END OF TRANSCRIPT

Interview Transcript #11 – vegetable grower in East Africa and international importer

November 2018

0:00

Introductions, project explanation, etc.

2:29

I: To start off, would you be able to summarise again in what ways you work with fruit and vegetables for and in the UK?

P: We source products and supply them into the UK retailers, so most of our production of about 30-40% comes from East Africa where we got our own farms, probably up to 50% of what we do is through our own farms and our partners' farms in East Africa. And the risks of the product, you know we trade products from the UK, we also got products in *[Northern African country]*, *[Central American country]*, *[South American Country]*.

I: Why is it that your operations focus on East Africa as a region?

P: I think that's where the company started. We started in East Africa. So, we started its operations in East Africa.

I: To what extent do you also process the produce?

P: Well we put it in retail packs. That's what we do. We do things like stir fries, vegetables in bags and that kind of thing.

I: So, you also wash it and cut them and process them ready to eat?

P: Yeah.

I: Which other businesses do you interact mostly with?

P: Retailers. So, we sell to the UK retail.

I: In your supply chain, do you also have your own transport, or do you subcontract these kinds of things.

P: That's sub-contracted. We don't have our own, no.

I: Do you only have your own farms in East Africa or also in other regions?

P: Yeah, talking about vegetables, yeah. We just got our own farms in East Africa.

I: And everything else you buy in from other farmers?

P: Yeah, from other suppliers.

I: Which other businesses would you say affect your operations the most?

P: Which businesses affect us the most? I'd say it's the retailers. Obviously, the demand from the retailers has the most effect on our business.

I: Ok. How much impact do you have on the negotiations with retailers?

P: Say that again?

I: To what extent can you influence demand of retailers, and the prices you get and the products that you can sell?

P: I think it's like any business relationship obviously. We're negotiating all the time. We're obviously in a competitive market, so you've obviously got, you have limited influence at the end of the day. But you're in the market and you're trading, so I guess you're part of the wider supply chain and you have limited options.

6:20

I: if we focus on water practices, what do you consider the main water risks that affect your business?

P: Obviously it's a shortage of water for the crops that we grow, basically. So that's the main risk and obviously there are a number of regions where we operate where water shortages have affected our ability to grow crops.

I: Have you been affected by floods or heavy rainfall as well, or mainly shortages?

P: Yeah, we've also been affected by heavy rain in the past as well.

I: But you consider droughts to be more relevant?

P: Yeah, especially in the short term. I think the long-term models in East Africa indicate that it's going to get wetter. But for example, we have a strong drought in parts of the country in 2017. So, yeah. The modelling is telling us it's getting wetter, but we haven't seen that particularly.

I: How has that changed your operations?

P: Well, we've done a lot of investments in water storage and water catching. That's one thing. We've also got a number of multi-stakeholder initiatives that we're involved with. And that's also guided our activities.

I: Ok. Do you mainly grow in greenhouses or in the field?

P: The vegetables are mainly grown in the field.

I: OK. So what kinds of stakeholder cooperation are those?

P: So, for example, there's a stakeholder initiative called *[name of initiative]* set-up by the president of *[East African country]* and Prince Charles' sustainability unit in 2009. That affects the *[name of watershed]*, and that's a series of initiatives that we have been involved with. It's a public private partnership, including mainly other stakeholders, retailers, *[name of EU country development agency]* and others.

I: Ok. And you felt like that has been helpful?

P: Yeah, very important. That's been a really important initiative. Through that initiative there's been a much more joined up approach to tackling the issue of the entire watershed, not just the people affected in growing agriculture.

I: Ok. At other stages of your business, with washing and food processing and packaging, what would you say would be the water risks you're experiencing there?

P: I think it's related to the same issues. Making sure there's enough water to process. So obviously the water used for processing is a much smaller volume. But if there's no water you can't process.

I: But that hasn't been a problem in the past?

P: No.

I: And how about microbiological aspects?

P: Yeah, no, our farms and pack houses have got the necessary equipment technically to manage microbiological hazards. The quality of the water is sufficient once it's been treated correctly.

10:30

I: OK. Would you be able to talk about how you manage and plan for these risks?

P: So obviously there's technical expertise, there's equipment to do it, there's the audits. The hygiene audits, all these kinds of things are part of the process of managing microbiological risks. Training as well, yeah.

I: Ok. In terms of water scarcity, you said you mainly focus on water storage and catchment?

P: Sorry, say that again.

I: In terms of water scarcity, you're mainly focusing on water storage and catchment?

P: Yes, and also, we've been involved with projects when we protected the forest nearby. So, we fenced 8000 hectares of forest nearby which is important for our watershed. So, we

produce the plastic posts and the other stakeholders managed to fence the project, using our fence posts, which we make from waste plastic. We're involved in initiatives like that as well where we're protecting the water catchment areas from encroachment.

I: Are you also applying different kinds of irrigation technologies?

P: Yes. There's mainly drip irrigation obviously that uses a lot less than center pivots or that type. Although some producers in *[East African countries]* used center pivots, we ourselves don't use them.

I: Ok. Do you also get involved with regulatory aspects in terms of accessing water?

P: Yes, all of our farms are members of the water users' association and the *[name of growers group in East African country]*, for example, which actually works with the public bodies on access to water, et cetera. There's been quite a good framework built upon in *[East African Country]* of water users' associations. There's strategies contained within the *[name of initiative]* project as well. Which are related to those issues.

I: Do you feel like these initiatives are really important for enhancing your resilience in the future or is it mainly the technical aspects which make a difference?

P: I think it's both to be honest. I don't think you can do one without the other. If you've got poor governance.

I: And how far do you plan into the future for these kinds of things?

P: I suppose in 2008/9 we undertook a very detailed forecasting, I think we did it until 2030. So we have done some activities relating to 10-20 years ahead in terms of modelling and seeing where our risks will be, etc. We worked with stakeholders about our supply chain and did that kind of activity. So, it's something that we do from time to time.

I: Do you feel like you're able to plan as far into the future as you would want to?

P: I believe so. I think businesses do plan for the long term, but, you know, we're not looking 50, 60 years ahead, I don't think. We haven't done that kind of activity. But 20, 30 years we've been doing some forecasting and modelling about this.

I: And you feel like that's generally good enough to plan ahead?

P: At the moment, yes.

I: So, if the impacts of water related risks would go beyond what you have planned for, say if the situation gets a lot worse than what your models predicted and what your infrastructure allows, what do you think would happen in the short term and in the long term?

15:23

P: I think obviously in the short term we would get overwhelmed and you wouldn't be able to produce the volumes of crops that you would want to. But then obviously with planning, future planning etc. you'd be able to invest further in water catchers. Especially in areas which are prone to drought. Obviously, it needs investment. A lot of the issues related to water security in these countries are not related to the amount of water being received rather than the infrastructure to manage it basically.

I: So, would you focus on improving that or would it also be an option for you to move to a different area?

P: It could be, yeah it could be. There might be some areas that become less able to grow products. I know, for example, in tea growing that that would certainly be the case where some tea areas become uneconomic because the rain has changed over the last 20 years.

I: In terms of your understanding of resilience, would you say that you would mainly try to protect and be robust in the business model that you have now, or would you also be able to change your core business and adapt to new conditions?

P: I think that's happening all the time to be honest. Climate change is quite a gradual process and people are making small steps all the time to try and tackle issues.

I: Ok. Are there any other strategies for increasing your resilience to water-related risks that you can think of but haven't employed so far?

P: I don't think so actually. I think it's mainly about protecting the water towers. In *[East African countries]*, most of the rain falls on the higher ground surrounding forests. So we've been making sure to protect those to limit climate change.

I: What do you mean by protection?

P: So, I talked about the fencing from encroachment – that's a big project. So, *[name of forest 1]* and the *[name of forest 2]* in *[East African country]* as well as the *[name of forest 3]* being fenced to protect them from destruction and obviously forested areas are much better for catching water and protecting the current climate.

I: How large would that area be that you're fencing off?

P: So, for example, closest to us it is 8000 hectares. But the *[name of forest 1]* one is much, much larger. I don't have the figure *[name of project]*, you will see that work being undertaken.

I: But these are not some sort of protected areas?

P: They are protected forests, but they get encroached and damaged. So that's what the project has been about.

19:15

I: Ok. Are there any external factors that limit your capacity to implement strategies or things that could change to help you better manage your water?

P: I don't think so to be honest. I can't think of anything off the top of my head.

I: Ok. And if you think of the fruit and vegetable supply system as a whole, what do you think should be changed to increase its resilience to water risks?

P: I think it's a combination of advocacy to make sure that we are supporting governments in this area because their ability to tackle the issue seems to be limited and obviously behind what is needed. So, there's a lot of work in that area. But also, continuing to use water efficiently and not to waste it.

I: Is there anything in terms of system-wide practices that you think shouldn't be changed?

P: That shouldn't be changed? No, I can't think of anything.

I: And if you compare your experience in the UK to *[East African country]* or other East African countries, do you feel like the UK is having enough awareness of these issues or is it lagging behind in terms of the discussions taking place?

P: I think the UK is well informed. We have a lot of discussions with our customers on the topic.

I: In your factories in the UK, what kinds of water management practices do you use there?

P: I think in some of our factories we capture the water on the roof and that kind of thing. But generally, it's done through the mains system and obviously using equipment and machinery that's efficient in water use. So, again, to minimise use.

I: Do you also recycle your own water?

P: We don't recycle our own water. We do in East Africa, but not in the UK.

I: Do you feel like that would be a good practice or do you feel like it's more efficient to have that done through the mains?

P: I think where our factories are within the towns, it's very difficult to get the land required to allow a recycling system to run. Compared to in *[East African country]*, we've got wetlands. We use wetland to return the water to nature.

I: Could you explain a little bit more about how that works?

P: So basically, there's a series of wetlands which collect all our water and return them to a lake. So, it's like a natural process of cleaning the water through a series of ponds. And that's sort of a requirement of growing standards where we operate, for example. So, all plans need to have that in East Africa to meet the *[East African countries]* standards.

I: So where does the water runoff come from?

K: So that would be from all the farm uses. From the pack houses, from the roofs, necessities, some of the laundry, that kind of thing.

I: Do you feel like there would be other groups of people who have a different opinion to you regarding these issues?

P: Maybe, I'm not sure. I think most people understand that water is going to be an issue and they need to take care of it.

I: Ok. Do you also have conversations about these things with retailers?

P: Yes. Most of our customers are members of WRAP 2025, sorry the curtailed agreement, and that's obviously also driving the conversations from their perspective. There are ongoing conversations about reducing water use.

I: And do they also incentivise you to have better practices?

P: I believe so. It's more of a discussion. I don't know if there are any incentives per se, but it's obviously something that they're very interested in.

I: So, we've also tried to interview some of the big UK retailers for this project, but it's been very hard to convince them that they have an important role to play in terms of water management. Some of them don't react to our requests and some of them say "you know, we get everything washed and processed so we don't engage in any water-use directly ourselves".

P: That's quite a strange approach, I must admit. I'm not sure who you're talking to, but I could certainly try and give you a couple of contacts.

I: Yeah, if you could do that, that would be great. Maybe we are just also approaching the wrong people. It's also hard to find the right person in a big organisation to talk to.

P: No problem, I'll try and give it a go.

I: Ok. Because I think even if they don't manage water themselves, they heavily depend on sustainable water use in their supply chains because otherwise there won't be anything on their shelves.

P: Exactly, yeah. That seems very short sighted.

I: Those were the main questions that we had. Did you have any other things on your mind that you would like to comment?

P: Not really. It's just interesting, it's quite a busy area at the moment and lots going on. So, we'll continue to watch what's happening and obviously take the steps as a responsible business to manage water sustainably.

I: During this summer, it was especially dry in Europe, was that also the case in *[East African country]* or other places that you source from?

P: No, not particularly. I think the problem we had was in 2017 in *[East African country]*, we had a dry period which resulted in declining production.

I: And then you had to buy in more from other places?

P: Yeah.

I: So, this summer didn't really change anything for you?

P: Not that I'm aware of personally to be honest.

I: That's good. A lot of the UK growers we talked to have had quite some difficulties.

P: We do source some products from the UK, but it was earlier in the year before the weather got dry. So maybe next year we'll have a problem from the carry over. The rain seems to come after the summer now and seems to be filling up everything as it should do over the winter.

I: Alright, fingers crossed then. Thanks so much for sharing your perspective with me. And if you could look into some of the retailers you work with that would be very helpful for us.

P: That's great, thanks. I'm sorry it was hard to get hold of me, but you did in the end. Thanks very much and good luck with your work. We'll be in touch.

I: Thanks a lot to you too! And no worries, it all worked out now. Bye!

P: Bye!

Interview Transcript #12 – SME fruit and vegetable producer for food service

November 2018

0:00

Introductions, project explanation, etc.

3:10

I: Is it ok for you if I record the interview?

P: Absolutely, that's fine.

I: To start off, would you be able to explain with what kinds of fruit and vegetables you mainly work with?

P: Yeah. We're predominantly vegetable growers. So we grow about 400 acres of veg, and then we have a far smaller fruit operation which is more like 20 acres max. And most of it is on land we own. Occasionally we rotate in some of our neighbour's land. Or we always rotate in another sort of 100 acres of our neighbour's land which we then have to water from our own water supply rather than using his. And another 100 acres comes in where we have a tenancy agreement and we were able to use that farmer's water. The vegetables we grow are for the food service sector, not retail and the fruit is for retail and we process it too for ourselves.

I: And in terms of varieties?

P: We grow leafy brassicas all year round and we grow spring onions in the summer and the fruit is tree fruit - apples, pears, apricots etc.

I: So, you said you mainly supply to the food service sector, is that your only customer range or do you also have direct sales on the farm?

P: No, we don't do any direct sales, we supply to sort of three large food service companies and then a collection of smaller ones as well.

I: How did that specialisation evolve?

P: Say that again?

I: How did that practice evolve, that you supply to food service instead of retail?

P: We've always been food service, and it's a fairly, reasonably unreported sector. Because you're probably well aware that the statistics say that more food is now eaten out of home than in home. So you sort of compare that, that's all coming from food service, none of it comes from retail. So actually, food service probably buys more produce than the retail sector in volume anyway.

I: Who do you supply from in terms of agricultural inputs or nurseries?

P: Who do we source products from?

I: Yes.

P: We grow all our own products.

I: Do you buy in seeds or do you also do that yourselves?

P: We buy seed and a small amount of plant transplants which come from a nursery, the plant raisers. And obviously we buy in trees from tree nurseries.

I: Which other businesses or organisations would you say affect your operations the most?

P: Which other organisations? As in competition?

I: Yeah, as in competition or demand, regulation.

P: We enjoy regulation the same as everybody else, that's a factor of life. We have competition within the industry in terms of the products we grow, but not too much. So, the

main challenge is always the great British climate and occasionally we have competition from imports as well.

I: What would you say are the main water risks that affect your practices?

P: There's two fundamental risks for us. Not having enough when we need it and there's also being able to get it onto the crops quick enough. So the example is what happened this summer, which was when we could see the water levels in our reservoirs going down, and we were worried that we, if it didn't rain, well it did, so we were thinking how many weeks do we have left of water? And also when you get high temperatures and high dry conditions like that, then you also have to get around, get your irrigators around the farm and start again fairly quickly before the plants die. Whereas in an average summer you might have a week to get around the farm. This summer within a week the crops were looking pretty sorry for themselves.

I: And are you going to change anything in your water management based on this experience?

P: We are fairly well off, we have winter fill storage. So, we have reservoirs. So, the last reservoir we built was in 2013, then we increased our capacity by 20 million litres. We put 20 million litres in as well around in about 2005 and that was on top of probably another 30 million we already had which has been sort of installed over the years within the last 50 years. We have water available at some of the tenant land that we rent. Some of them have winter reservoirs as well. Then we do have a neighbour who has retired from active farming, or at least he now contracts, or uses crops like wheat who generally don't need irrigation. We have the opportunity to buy probably another 10 million litres from him if we need it. We did buy some this year just in case but then we didn't need it in the end.

I: Have you ever had a situation where you ran out of water or it negatively affected you?

P: We have. 2003, I think, we got to the point of actually having to sort of say, certain crops, ok, we probably won't have enough, so we won't irrigate that field and we scraped through. So that was the last time we actually had to abandon crops. You have to remember, if it's vegetable production, field veg, you're trying to irrigate the crops that you want to harvest tomorrow, next week and the week after. To keep the products and keep them looking as they should. But you also have to irrigate the crops that you've just drilled. Say if you're drilling in late August, that's the crop for next year. So, if you drill that, the seeds germinate. And if you don't irrigate it then they will die, and you won't have your crops next year. So, you have to prioritise what to irrigate. At some stages it's probably more advantageous to irrigate crops for next year than it is for crops for the present. So that tends to be a calculation, not calculation- that's giving it too much credit – it's an educated guess at the time about what you look after and what you don't. I suppose we've got a couple of our orchard fruit we stopped irrigating this summer just in case. Because our core business is veg, that's our priority. So, we paused the irrigation of our fruit this summer.

I: What are the main factors that feed into that decision?

P: This summer the key factors we got were making sure our core crops were protected, if you like, so we kept irrigating those. The fruit is a less important part of the business so that's something we got less behind. Arguably as well you got to take in the growing conditions of the crops. So, apples and pears, however much water you chuck on them, when it's above 25° they're not going to grow anyways, because the cell division has stopped because of the temperature. So, a high temperature could make the decision for you, because there's no point in giving lots of water other than to keep the trees alive whereas normally you'd be irrigating to increase the fruit size. With the veg there are some cultural practices that you undertake, so you treat them with a certain type of irrigation as

part of your pest control. Which therefore has a value over and above just irrigating. So, you know, that would take priority over a crop that just needs it for the water. Because if you use it as a pest control mechanism you don't have to spray lots of chemicals to take control of it.

13:10

I: That makes sense. Do you also have any water risks apart from scarcity? So flooding, heavy rains, microbiological risks?

P: The very obvious way of it is, the risk or the problem we have is very clear. We've got our weather records going back to 1948, and there's a clear change in the weather patterns and the fact that we don't seem to get summer showers anymore. So, the sort of fond memory is to have a nice, soft rain in the summer. Doesn't happen and instead you get a long dry spell and then you get torrential rain. So, summer showers just soak in nicely and they have a great advantage to the crop, whereas torrential rain, especially in the summer and especially with veg when we have bare land because we're sowing, drilling and harvesting. You get soil erosion and also if it's been dry for long the water can run straight off and not soak in because of compaction. So, we then have an erosion issue which, that's noticeable not just over the last four to eight years but over the last 20 years, we've seen the change in how we get the rain in the summer. We still get the same amount of rainfall over the year. We just seem to have it mainly in the winter and when we do get it in the summer it's in heavy rain with long spells in between compared to 20 years ago.

I: How about microbiological issues with water?

P: Say that again?

I: How about microbiological risks in water?

P: It's an issue for us. Our crops are not harvested and packed so as ready to eat as such, but the microbiological risks of winter fill reservoirs is that they have fish and fabulous wildlife, levels of birds as well. So that is an issue but that's always been an issue, there's no increase or decrease in the risk. And it's something you understand with produce anyway.

I: And so, in terms of your water management practices, you mainly focus on increasing your water storage, or what kinds of different strategies are you using?

P: Yes, so obviously you already know about the water storage. Our orchards have irrigation, so they're irrigated orchards with fixed irrigation lines under the trees. One orchard is set up to have split zone irrigation. I think you probably, have you done a lot of research on it?

I: No.

P: Split zone irrigation is a lot on strawberries and potatoes. Basically you water the left side of the tree on Monday and stress the right-hand side of the tree. And then on Thursday, for example, you would swap that around to the other side of the tree and stress the other side of the tree but keep the tree alive. So basically, you're telling the tree it's under stress and hasn't got enough water, so it produces more fruit. And they have higher sugars but effectively you use less water because you only irrigate half of the tree.

I: Ok, so that's what you also do with grapes in wineries.

P: That's right, it's quite common practice. With field scale veg that's not possible. We're always looking and considering the method of irrigation which is probably the next thing after increasing the storage capacity. But then you have to balance that again. Existing assets in terms of all our irrigation equipment to do overhead, and also our culture, the way we grow the crops would have to change as well, so that would be a fairly enormous step for us to switch from overhead to trickle. I think it's probably inevitable one day if the climate keeps going where it is. But again, you then find yourself weighing cultural practices as I've mentioned before that irrigation can be part of your pest control and you have to weigh up

what's better. Using a bit more water and not spraying, or spraying and using less water. We'll see on that one. The other thing is also maintenance of storage facilities. A lot of reservoirs have a lot of willow trees around them and the willows are sucking out a lot of water every day when it's sunny.

I: Is that actually noticeable?

P: It's hard to measure it. I can read how much a willow tree takes out and we have controlled the willows as much as we can around the reservoir, but they're notoriously difficult to get rid of. So, it's an ongoing task but that's sort of good practice I suppose. People would say you don't have a reservoir with willow trees around it. The other thing is, it'd be interesting to know how much one loses in evaporation because we need to look at what we do with the surface of the reservoir to prevent that if it was of a scale that causes a problem. I don't know if it is or not.

19:25

I: So, the practices that you're considering but not using yet, is that mainly because of the effort that's involved, or the capital investment, or just because it wasn't necessary up to this point?

P: Probably a lot of it comes down to effort. On evaporation I don't know the data, so I don't have the information from which to make the decisions. I know some people where they've got what I call artificial reservoirs, so level reservoirs that are on flat land which are then banked to put a liner in. They're quite easy and I know some people have been covering those with solar, but that's mainly because they're not finding any new space to put their solar on, rather than any specific information on water loss. We have, because of the geology of our farm, we are able to build our reservoirs with clay. By digging the clay out of the hillside and throwing it on the bank up on the downhill side. So we don't have a type of reservoir where that's an option really. In terms of shifting to the trickle method, it's something that we keep a watching brief on, but at the moment we've got enough water, so we don't need to do it and we stick with the capital assets that we've got and haven't seen enough evidence to know that we need to switch.

I: And how far do you plan into the future with these things?

P: How far do I plan? When we plan a pear orchard, we hope that it will be there for 30 years plus so then we plan quite a long way into the future. On the other hand, if we think that we can reduce water use next year by doing something different, when it doesn't impact on yield or returns then we would be able to do it overnight practically. We're a small business so we can be quite nimble. We tend to plan quite long-term, but we can move pretty fast if we need to.

I: So, you would say that you are able to plan as far into the future as you would want to in an ideal situation?

P: Yes. If we look at building reservoirs as well, that's fairly long-term planning as well.

I: Say, in a hypothetical situation, if the water-related risks would go beyond what you have planned for, what do you think would happen in the long-term and in the short term?

P: If the risk increased as such? It certainly affects cropping. There's no point in growing something if you don't have enough water for it. And that's a very simple decision to make in some aspect, if you know that you don't have the water for it, say if we then don't take on land, other farmers' land if it doesn't have water with it. So, we will only rent land where we can reach our own irrigation or if there's irrigation available. So, when we rent land, we need to know if there's enough water available for us. And we've had this incident of finding land

in a good location, and we haven't taken in because there isn't sufficient water available. So, it does dictate where we grow and what we're growing.

23:07

I: If you wouldn't have enough water in a more long-term situation, would you be able to focus on less water intensive or higher value crops or what would you do?

P: If it was going to be an issue, we would inevitably focus on different ways of using the water and different ways of applying it. We already do the obvious things like not having leaks and irrigating at night etc. But yeah, you adjust your technique, or you adjust what you're growing.

I: Ok. And so, in terms of being a resilient farm in the future, you would also consider changing your core business?

P: Yeah, we've got fairly small trawls on the ground that would probably need less, so we would focus on cropping that rather than the current cropping. And yes, we've changed cropping before due to outside pressures, so there is no reason why we couldn't do it again.

I: Are there any other strategies aside from those that you mentioned for increasing resilience to water risks that you know of?

P: The obvious one is still storage. So, our reservoirs are refilling at the moment so we're not full yet. Despite it having obviously started raining in July and has rained a reasonable amount since, our reservoirs are still filling. But there will come a point and there usually does come a point fairly soon when they are full. And you get storms in the winter and you have huge amounts of water going down the brook, down the stream, which have potential to sort of, which is unused, so there's still the potential to store more. If you have the facilities to store it and the licences to use it. In some respects, one questions the reluctance of the Environment Agency to not issue more or increase licences. Because if you could store more, you should be able to use more. So, I think, you know, if we for example where to buy more land and it had a side on it on which we could build a reservoir on, then the obvious thing for me to build a reservoir and take that excess water in the winter, store it so we can use it when we need it.

I: And you would be applying for licences?

P: Yeah, that's right. But as far as I'm aware, it's extremely difficult now to get a new licence. If you rang me in February (?), not minding the fact that there's lots of water going down the brook and I'm able to see it because it's not far away that could be taken without impacting the flow of the brook or the volume of water significantly in the brook in terms of wildlife impact then you would be able to use that in the summer.

I: So why is the environment agency so protective with it?

P: Understandably, there is a difference between storage and licencing. You can store and you are allowed to use a certain amount. So in some respects you can end up storing more than you are actually allowed to use. So, if you can build more, store more, in some places you use it for flood mitigation downstream and you would think they would welcome that. And would therefore be able to issue new irrigation licences to use it. But as far as I understand, I don't think they are issuing new irrigation licences. But I understand not issuing them where there's no new water source capacity, but if people have got a sustainable source and they can increase that, I would have thought that then that could correspondingly be used for increased irrigation capacity. I might have got that, it may be wrong but I think that's how it works.

28:10

I: Other technological innovations in terms of irrigation and things like that, have you been looking into that as well?

P: Yeah, we have a constant watch on tech water, weeds, etc. you name it. We're fairly involved in keeping an eye on that sort of thing.

I: But then there's also a financial constraint there?

P: It is. What happens to the cap or the subsidy structure as time goes on. With Brexit, it's what funds will be available and how they will be available? So there's a lot of significant infrastructure installed through the producer organisation system. And that's an EU mechanism which we're told will be maintained until the end of the current parliament, which might be until about 4pm this afternoon. But yeah, maybe 2022 but it won't be that long and then if the new government decides that's the way to go, then that will only be available to people within producer organisations and I think it will be used to increase the consolidation of farms into bigger organisations rather than the smaller farms.

29:55

I: So, you think Brexit is going to have more of a negative impact for you?

P: Well, if it, a lot of the capex that can and probably inevitably will be part of the solution to the resilience both in water and elsewhere, is going to need significant investment and it's about how that is brought into the industry. So, the new regulatory structures for the funding and subsidy will influence that considerably. So, you can't get it because you're a small grower, you're not part of a PA, then you won't be able to keep up with the resilience. So, you either need to be part of a producer organisation if you're allowed to, or you sell out to a big organisation.

I: So, do you think you would be considering that?

P: We have to constantly consider the producer organisation route, but we probably have a sufficiently innovative and unusual business not to need to do it. The ultimate option is to sell, but you always have to know that it might.

I: Why do you prefer not to be part of an organisation?

P: There hasn't been an appropriate one for us to date. A lot of people in the past did it for the sake of the EU monies, they all got in trouble, a lot of them disappeared. And they're also geographically a fair distance from here, we're sort of on the limit here in terms of veg production, it's mainly arable in this area. And you need to have complementary businesses, so there's no point in me joining a PO who supplies retail, they would be saying you're just doing it for the money, there has to be a reason for it for cost savings and efficiencies.

I: Thinking about the fruit and vegetable supply system as a whole, not only your operations but also all the other farmers and stakeholders as well, what do you think could be done on a systems level to increase resilience to water risks?

P: I think it is focusing the spending, the research spending in the right place. At the moment it is a fairly disparate process, we're all levy payers but how that gets spent is quite controversial. And a few vested interests, while some people would argue to take more of the funding which is short term issues rather than long-term resilience.

I: And in terms of policies or regulatory approaches?

P: There's plenty more that can be done in that way. A big part of it is how they reorganise post-Brexit as well. They have an opportunity to make it a key part of the system which it isn't at the moment.

I: Do you think there is a chance that there will be support for irrigation techniques?

P: I think we're hearing lots of noise that there will be a lot more focus on environmental goods which therefore I presume include water resilience. So, the noise is a positive thing.

I: Ok. And can you think of any practices in the system that shouldn't be changed?

P: No, I think there's a lot of, I suppose in certain crops at certain times of the year one does see a lot of water coming off the fields. That could be perhaps more actively controlled. I just got to run out and to something for someone, are you ok to hold a sec? Or are we done?

I: I have one more question, but I can also call you back in a bit.

P: Ok, fire away with it.

I: So, what other stakeholder groups do you think would have a different opinion to yours? And why?

P: I think I probably have a fairly common opinion from my sector.

I: Ok.

P: If they are irrigating, I think it's a fairly shared focus really.

I: So, you don't think it's a very controversial topic?

P: No, no. Everyone gets it, and everyone can see changes in the way of the patterns, a lot of farmers have been here for quite a long time, we sort of know. It's really clear when you look at all the records, we can see it far more clearly than those people can. But that's, the key one is that we might be getting similar amounts of water, but we get it all in the winter or if we do get a shower, we get it in one big heavy load, and not in manageable regular rainfall.

I: Ok. One thing I've been thinking about – it's been quite difficult for us to get food service people on the phone for interviews. And so, I was wondering, as you work with food service, if you would have any contacts you might be able to share with us?

P: I will give them a nudge, and if I can I will introduce you.

I: Ok.

P: They do like to keep their head down compared to retailers who like the sound of their own voices sometimes.

I: Yeah, and it's a shame because then their perspective gets left out.

P: Right, and I can understand the challenge in that respect.

I: Alright, thanks so much for taking the time to talk to me.

P: No worries. Bye!

I: Bye bye.

Interview with Retailer Q – Interview (b)

Project Introduction

A note about serious games:

Qb: Yeah the EA did something like that about 8 years ago, when water was first at its early stages, which was a scenario based principle, the IDG, followed that up and did some scenario planning in a workshop. In the early days, we managed to get some growers and suppliers together, but everyone was like “well this never really happens so...” it was difficult to get much engagement – and in the end one of the growers, I am not sure if you have met [xxx], you may have bumped into one of his sons, but he was like “well no one is going to do anything until the crisis happens and we won't know until it hits...” And I thought well you are right aren't you so the next workshop at [South England] was based around the scenario, so this is the crisis, this is what has happened and it was run just at the beginning of 2012, just at the end of the drought and just before 2012 started to rain. So that was very interesting as it ran through the cycle. Which we are now playing this year for real.

Int: So hopefully, people will be interested in participating in the game when it comes around.

Int: So I wanted to tell you about three main areas - product quality specifications, contracts, and water risks.

So specifically, XX told me that you have a lot of experience looking at quality specifications...

Qb: yeah so I have been looking at the same area for the last 8 years and prior to that I have worked within the supply base and for other retailers, so I have been around a bit.

Int: So I am interested in how specifications have changed over time?

Qb: They haven't changed over a long time frame, but there is a movement within a single time frame depending on seasons. So onions for example, the specification was drawn up donkey's years ago to be honest, links back to the old class specifications, so class 1, class 2 – but there was never really any class 1 onions, because the requirements were so difficult you couldn't grow it they were always class 2 – but obviously there are some classed fruits. The original specifications were built around those. And they still stand as they always have done, but then each year, depending on what the year has been like and what the growing conditions have been like – we will see what the crop is like when it comes in and flex the spec to reflect the best that is available. So 2012 after the drought and then the wet, at the moment of drilling until harvest it rained, so we had to change the spec on the onions to say that they could be smaller. We didn't do anything with the level of rods, because legally the level of the substance cannot be not as expected. But the large onions were a bit smaller, the skin finish wasn't as bright, so if you think about a Spanish onion, in your head, they are nice and shiny with a chestnut colour, but in 2012 there weren't many that looked like that in the UK. They were all a bit scabby. Depending on the soil types. If you look at crops that have been grown at places like [England], which has very light sandy soils, to our surprise in fact, that sand where it was touching the skin, where it was wet, really stained the skins. In our heads, we thought that the water would drain quickly, and it would make the onions look better than the others, but in fact it didn't work out that way, the dark colour stained the onions, but we accepted those. And then with the dark peaty sands of the [East England] actually didn't stain the skins. The dark peat of the soil took what warmth there was and actually warmed up the skins a bit better, so we accept them all because we had agreed that these were our growers, and we just did the best we could with it – without completely annoying the customers to the degree that they say they won't buy that – that is offensive...

Customers you do find when [name] or [name] puts up a wonky veg in front of them, with a camera, they say well yes of course I would buy that, that is perfectly fine, but if you look in our stores, what is left in the loose areas is... you know... people are choosing the best that they can... It still needs to be practically free from rots, damage and pests, but we move to fit with it. Similarly with other crops, Brussel sprouts for example, vary dramatically from year to year. So 2 years ago they were huge, which customers don't like that much, and 2012 they were all pretty small... because brassicas don't like growing with very wet feet, so they were stressed, but in that case we would flex the spec, so over a time frame of 8 years the spec hasn't changed but within that time we will move with the crop in order to get the best out of it.

So there remains one ideal standard, which is pretty consistent, and then you sort of deviate depending on the season...

Yeah, and if we have a field, where a grower has had an issue and where the crop doesn't quite meet the spec, we will have a discussion about how we can get the best out of it without disappointing customers... because there is no point disappointing them because they just won't buy it. No one wins. The losses just happen somewhere else.

So when you change the spec, I guess the example of this year, you might be reducing the specifications for size and that sort of thing... it is a way of grading the produce but how does that impact the individual growers? Are there ever any examples where growers are unable to sell anything? Or for a price that they can settle for? Or other growers who have done much better?

So these days, prices are agreed up front, this year where all costs are compounded and yield is going to be less, there has to be a discussion at some point as to how we balance it out. Because, if we don't have a grown up conversation about it then people will be like, I am not going to supply you. I'm going to go to the spot market, because prices are going to be huge there. We do understand that, and so everything is agreed up front and the grower in a normal year on products like roots in the UK, if you are growing carrots, you have got to have a supplier you are going to want to harvest it, wash it and pack it. You can't do it without. Whereas our brassicas, broccoli and cauliflower, you can grow it and to be able to sell it to a retailer, all you need is a rig where people harvest and put it into the bags and then a chiller back at the ranch. So in the UK on the brassica front, we are dealing with smaller people – grower/packers. Whereas for carrots, we are dealing with businesses that tend to grow, the people that own the washing and packing facilities are growers in their own right and they will have lots of agreements with smaller businesses. Whereby – it could be a mixture – where they are renting land, growing it themselves, or they could be engaging with the grower that he will grow material for them, that they will harvest and pull out. And all those contracts are different, so I have one carrot supplier who grows a lot himself, but in order to grow it himself, he has contracts with a hundred different land owners, all of which vary. So he might be taking a field on one estate where the rent, the land rental, includes the first 20ml of irrigation water because the estate will never get their money back in order to pay for their licence and the money to take the irrigation kit out. Versus other ones, where they have to pay each time they irrigate, so it varies quite a lot.

So the grower has those contracts with the packer, or land owner, but from the point of view of XX you have the contract with the packer, you don't take an interest in those contracts further down the line, or?

Yeah, so, we will know who they are renting land from or who, so if it is a land rental where they are doing all the growing then on our packets it will have the person who is renting the land and growing

the crop. If it is the landowner who is growing the crop themselves it will be their name that will appear. And then there are a couple of others where the land owner likes it to appear that they are the grower, but in fact they don't, but as a part of the agreement it is their name that goes on the packet, but we know where it is really from. So most of the packers will have a specialist agronomy team supporting whatever is happening in the field and that can vary depending on how experienced or how the grower operates. It could be that they are an absentee or they could be hands on, on the tractor, doing the applications, but that would be under the recommendations for the agronomist who works for the packer.

So we do know who they are but we won't necessarily be having a direct dialogue because how much of their material that ends up in a packet, coming to us, or how they have grown it, does impact on that, but there are a lot of other things that happen along the chain, like building a big pack house or a wash tank and all of those things, so there are a lot of costs there in addition to growing the carrot. Whereas on brassicas it is a bit simpler, where we are dealing a bit more directly with people, it is the person who owns the fridge, and the dispatch area, who is also the grower.

Does that make it easier in some ways to have direct contact with the growers of brassicas compared to others? To have less...

The thing with brassicas, and roots as well, is that we have a massive geographical spread. Which does link into the water beast, which links into a lot of other bits too. So cauliflowers we take from [range of UK locations]. Broccoli is the same in the summer. And in the winter, we will have cauli from [range of UK locations], but also from Spain, because Scotland can't support cauli and broccoli all goes to Spain in the winter. In Spain, we really only have two big growers. And [North England] in the summer we have got three different growers, one of whom only does cauli and broccoli, another that does a little more and one that also does cavolo nero, sweet stem cauli, and a much bigger portfolio.

It does mean that on a Tuesday, myself and the buyers are speaking with everybody, saying ok how is the crop looking, what is happening short term, any issues long term, at the moment the calls are quite long, because everything is all a bit unsure, what has the rain been like that was our last call, has abstraction been stopped? But at other times, like last year, it was more like, should we have a call oh well I suppose we could have a call. But this year is more like, right we need to have a call, we need to have the numbers in we need to know where we are at...

So you are wanting to keep on top of how much you are going to get from each person?

And is someone can see that cauliflower is being really unpredictable, if someone in [South England] can see that in three weeks they are going to have a gap, then that means that we have three weeks to find out if any has got a flush coming, which with cauli if you are lucky usually works, as long as you have a big enough spread, someone else has got a flush. So if weather conditions are different, you can say right, brilliant hold on to it, we will fit it in, so to try and get it to balance out, so at the end of the season, everyone has actually supplied the programme that they were asked to supply but not necessarily at the exact times they would of. But carrots and parsnips are kind of different as they don't flush, they are a bit better behaved.

I tried to grow cauliflower once, but it didn't work out...

It's not worth it, just go and buy it from the shop...

It is probably where molly-caudling comes from somehow...

Yeah probably, so the other bit with having a geographical spread, it links in with water, soil types and pests, so we have an awful lot of carrots that come from Scotland which one you have to do because that is the only place they will last, otherwise it gets too warm in the Spring, and they want to die, or bolt, one or the other, but in Scotland you have crops in the valley so they get really good daylight at the minute, but in the winter they put straw over the top in case it snows, but the advantage up in Scotland, is that you don't get much aphid, and if you don't get aphid you don't get virus transmission – so it is a much better place to grow. But you can't get early carrots in Scotland the spring is too cold, so you have to get them from [North England], but if you are in [North England] you have to be more sensitive about your water, but also this year in Scotland, this has also been the challenge but not as much as they think.

What do you think the impacts are, what would happen if you can't get as much UK domestic veg this year?

So there will be, at the beginning of the year we struggled because the Beast from The East came right through France, and bits of Spain... So normally we would take really early carrots from France, but there was none to be had, so we ended up stretching last year's crop a lot longer than we normally would, and this year that we are now into – we are now at the stage of counting to see what we have got. Because with some fields with carrots, they are drilled into a bed, so the size of the beds, as the seeds were put in moisture was drawn up as the beds were built up around them, so they have germinated not too badly, but for the rows where they have been exposed if they did germinate, haven't germinated, or have only just germinated now, they are little piddly things – so we are now at the moment counting and everyone is trying to forecast to see how much we have got. And then the options will be, the argument will be to go to Holland, but those carrots are lifted and put into cold storage, for which the average aglo-saxon is going to be like, what is that... so it may be that we will have to work with what we have got, and then pray that we have a warm, not too cold winter, and a warm spring in the places like France, and take some imports from there. Which, if we do that early enough, that is doable, so 2012, in September, we realised that we weren't going to have enough swede to see us through, so we actually moved all the gear to grow the swede, which is nets cover them to stop the cabbage root fly getting to them, and moved it all across to Portugal, and grew them in Portugal.

Carrots are obviously a bigger demand than swede so it is going to be more tricky but they will end up being more imported and we will make sure that every carrot that is grown this year that we can find a home for. So we do already have a 500g bag of carrots versus a kilo, short carrots we will keep pushing 500g through so that we sell every single one, so everyone gets a return on it, and we won't push silly promotional activities, because what is the point, we just need to make sure that we stretch it out as far as it can go, and that everyone gets the best value return.

SO it will be a mix and very crop specific.

I imagine that it will be very expensive to buy on the open market to make up for the short fall?

We won't do anything on the open market, if we do import then it will have been grown for the programme.

So it would only be with potatoes that you would do something like that?

Potatoes are more of a mixed programme so there are some that are grown to programme, then there is always an element of how much you don't run to programme and how much you run to

market. But even when you are running to market, you will only be buying material from known growers, you won't be just buying from a big commodity buyer.

But with roots it's a, with carrots and parsnips, particularly parsnips, the UK is the only market for them.

But no one will grow parsnips on spec, inside or outside the UK so they will all be done to a programme. So you are adding to the costs if there is reduced yield, but there are also things like you have to put straw on top of them through the winter to stop them from getting frosty, and the straw is less than 12in this year so it is really really expensive.

So what happens with regards to those costs, are they distributed throughout the supply chain, is the burden for paying those costs distributed?

2012, we did, how it will work now, because there has been quite a shift in retail prices, so whether there will be more inflation, that will just go back to where the costs were incurred, we can't take any of that, that isn't how we function. There would be a bit of a riot – but how that will pan out won't really hit until Jan, Feb, March...

But for those products where you need really big carrots, like carrot batons, I know some people are importing carrots to do that now, but we are not, just because there are larger carrots outside the UK, there will be a significant on cost for that, and some folks have put their prices up for those.

But I know that some people have been used to selling two different packet sizes, but now they are doing just one to concentrate the sales. The last thing you want to see at the moment is products going to waste.

A lot of farmers that I have spoken to, we had a questionnaire and we have about a hundred responses, the vast majority said that they had felt, with the impact of water scarcity on their yield, they bore almost all of the costs of that – it wasn't really to consumers or the retailers that absorbed much of those costs.

We have an awareness of the costs, and it is a mix and match, if you are taking crop from [North England], carrots from [North England] there is a risk associated with water, but if you are taking carrots from Scotland, you have to drive the things all the way down here so there is a cost there, so there are different elements that build up that costs, so you don't think about it equally, you don't use the same amount of chemistry in Scotland, because you haven't got the aphid, as you do in [North England], but in [North England] you have got the hotter springs and you can get into the market really early. And your crop has an opportunity to get to a large size. But obviously if you have inherited land in [North England], you don't really care what is happening in Scotland. It's not your issue.

Do you test taste?

No. It is too subjective.

How much do you interact with the commercial arm?

Very very closely but they do the final volume requirements because they are driving the sales programme. So the crop calls on a Tuesday are conference calls with the supplier, techie, the buyer, the supply chain colleague, they do the actual placing of the orders to the suppliers, in response to our forecasting system. Which is in theory really intelligent, it says oh I have sold this much so tomorrow I am going to order this – it doesn't always work quite like that, but we will work really

closely with them, but deliberately as a techie, you don't dive into the prices because that's where angels fear to tread.

But you would justify the desired seasonal specifications with the buyer – bearing in mind the seasonal conditions these are the things that we will flex.

At the moment there aren't that many documents in terms of a fixed contract but there is a price negotiation and that includes the terms of payment, the specification of the product and the distribution so that is all built in. So when I go to look at the onion crop, do the assessments, the buyers will come with me. On brassicas, the guy will be with me. The only bit I do completely on my own is as we get nearer Christmas I will be out in the field counting, literally, and agree where we will be taking from. At Christmas we have daily, if not twice daily calls to check where everyone is at, how harvest is going, so work completely hand in hand. So a brassica buyer, who is on holiday, but I have done all the root calls on my own, but we work really closely together.

So if you have an agreed contract, a verbal agreement, this amount of carrots at this quality at this time, and the grower fails to do that, what are the repercussions?

It depends what the reasons are, so this year, everyone is going to struggle so we are working on a plan and solutions, if there has been a reason, the impact on the individual grower wouldn't be from us, but there would be an assessment as to what the problem was and why did the crop fail, or why did they fail to supply, trying to understand why. So if they aren't a brilliant grower, they didn't plan, usually the issue is that they didn't plan, at the supply level, enough for the right time, and most of our suppliers supply other people too, you never put all your eggs into one basket, we like to work with people who are supplying more than one outlet, because we all have different specs and there is usually a home for all the crop. Something like carrots, people will be packing for us, and likely some smaller retailers, and maybe some element that goes to a market, and some that is business to business, like ready meals, and that is the sort of business that we like to deal with. Because everyone can flex and there is a home for the crop. People ask if they can supply us exclusively – and it is like no. But it sounds so much better, no it is rubbish, it is a really really bad model. A few years ago, xxx did something with parsnip growers up in [England], and they managed to go bust twice, and they were dealing a lot with us, as well as another retailer, and that retailer was there only customer, and part of that – they are tricky to germinate, you'll find that where each that hasn't germinated, the alternate one has become huge like a sugar beat, you need to have a lot of outlets to be able to get the balance between larger loose parsnips, smaller packed ones, and then you have perhaps got the people who have the catering market, people who like little parsnips, and then also supply the hand-fried crisp market and wholesale market.

So I have someone who I use at Christmas for a top up, but who has all those different outlets, and the catering market for parsnips is busy the week before Christmas, because that is when everyone is going out for Christmas office lunch. And Christmas week we ramp up, the caterers have all gone home and he has got space for us, it is a brilliant business model.

So you are basically dealing with very large and well connected supply businesses to provide the supply. And it would be unusual for then not to be able to supply you with what you want.

Are there some cases where they are not able to supply the quantity you had agreed, would it be up to them to provide you or pay for the cost of sourcing from somewhere else?

No, I don't believe so. But when the contracts come up for renewal we might ponder hmmm....

There is no penalty throughout the year. But that is why we have the structure we do on brassicas, some retailers will concentrate their brassica sourcing from Lincolnshire, but that will mean that there are times of the year where you can't get what you want, and that is your own fault, we need to be responsible for understanding the crops that we want to buy. And we will have people at the seasonal review, who will say me me me I want to do 90% next year, I want it all – and it is like – well you struggled to do what you were supposed to be doing this year, how do you expect to do that, well we will grow more – yeah but your geography is such that you ain't going to get any more. And there is a limit to how many fields are suitable for growing these crops. We think that most of the UK, where there is stuff being grown, oil seed rape, sugar beet, combinable cereals – there isn't much that is veg.

And it has to be rotated too.

Yeah, like carrots, you need 7-10 years, if you want carrots to last until next May, that is usually virgin land, or hasn't been in carrots for 15 years, so we are not going to be back there for 15 years.

So there are natural limits to what can be produced and you operate a very diverse sourcing strategy to keep it balanced.

What is the process behind getting consumers to accept new cultivars of potatoes?

So people are very loyal to the big names. A group of customers will go to buy King Edward's, Maris Piper, that is what they are going to buy, that is what they are looking for. The only way you can bring in something new like whites, we do sell white potatoes, but if you look across all the retailers, it is really hard to see, because if you look at it, there are a lot of spuds here but they are either very much a named variety, or there is just these couple of packs that claim that they are just whites, so it is really hard to bring in something new without having a whole aisle that is all spuds, of which quite a lot of folks won't buy. And then obviously there are salad potatoes, so again there are few named varieties that people will recognise, but it isn't easy to bring in anything new.

I guess that consumers go to super markets every week, and they go and do the same thing every week, and don't necessarily have a conscious thought process that they are going to try something different. Because they are just doing what they know.

And certainly on potatoes they have a group, a significant group will have the thought in mind as to the variety they are going to buy. Because it is for the Sunday roast, it's for roasties, it is for mashing, and to bring something new is quite challenging. So that has been looked at. I looked after spuds for about 9 months and that was enough but there has been work done looking at different salad varieties. But then you have to think about how many different varieties you want, it is quite difficult to display.

Already in the UK, a lot of my colleagues come from Spain, because there are a lot of water specialists, people who come and they are saying that in Spain you just have potatoes, we don't have different kinds of potatoes. In the UK you have all these different kinds of potatoes. Some people are quite impressed by the diversity.

But if they try to make Spanish omelette with our spuds it is a disaster, you need to use theirs because they have higher solid matter and it works. And they have to use Spanish onions too.

In terms of water risks, is XX more concerned with micro-biological risks or are you also concerned with water-scarcity risks?

We look at it in the round, which goes back to the bit about growing things in different areas where there are different associated risks, so we look at that across the board. Certainly looking at roots and brassicas it is essential that they can be irrigated so that really does restrict you. You have to be an absolute hero to grow then where it isn't irrigable. So there is quite a difference, and with onions and leeks they all need good irrigation.

So you would be concerned with water availability with respect to getting the right quality and quantity, but are there ways in which you work with growers to adopt new technologies or different ways of growing?

Because we are dealing with quite big chaps who are all well known they are all members of the UKIA they are all familiar with best practice. But you do see somethings going on, like did you really mean to water the A30, but people understand and are measuring what they are applying, so we would be concerned about anyone who didn't seem to have a clue. They are all members of UKIAH and in one way or another they are all paying for the water. Licences are one thing but they are also paying for the fuel for the pump, to get the water to where you need it and to then apply it – it can be huge. And the labour to actually get, people are struggling, because people who do it are running out of hours because they have been going for the last nine weeks. So trying to work with businesses who understand the best way of doing it.

And another thing that we have been doing, growers have been moving towards pheric slug pellets as opposed to metaldehyde – well many have moved to using nematodes. And where we have people use pheric slug pellets we have had customer complaints that don't break down so quickly, so it is great for the water, but we have green and blue bits in our savoys and greens so we have now linked up with the slug pellet more quickly for the last application, so we can get away from the customer complaints. So we have facilitated that with the slug-pellet manufacturer, because they were like we know what you want you want it to be persistent and to maintain intact for as long as possible, and we were like no we flipping don't and so we got everyone in the room shut the door and said that these are the customer complaints we have been getting, because customers quite reasonably think it is toxic, but in fact it isn't because it is pheric.

So we facilitate things when we are in a unique position to do so, but for things like leading edge stuff like abstraction reform, which we were asked to do, but we are not boots on the ground, there are financial pieces that we have nothing to do with, which some of the bullies think is quite odd, but we are not here to run their businesses for them. That is what they are there for. So that gets quite tricky.

What about internationally?

So on the strategic side, obviously I take stuff from Spain, but the key issue is to get the fine detail. The big red blob on the map is fine but we need to know in more detail.

So we have an interest in that and we have been trying to work out how to drill down into the detail there. Because if we think that there is water scarcity there and we have to pull out, that could destroy peoples' businesses. So we have to get that balance.

So you would have one overarching strategy, it would be more on case by case basis.

Yeah, so some of the areas in the UK which are required are more about flooding and washing off as opposed to not having enough. And in Spain there are different areas where things have been all washed away.

Is XX moving away from using other certifications and towards their own certifications?

It is a mix, we have the basic red tractor in the UK and global gap for outside, but we are looking to use bespoke certifications for key raw materials but a lot of those like carrots, there is stuff in there about water stewardship, but there is also junk in there about the use of straw, or the black plastic field covers and how that is managed. So there isn't a specific water piece, it is more about the whole sustainability piece.

How difficult would that be to implement, where you are dealing with large suppliers who have a lot of different farmers they source from? Is it difficult to measure?

It would be difficult because people are handling a larger volume of material than say just ours, so it would end up that every grower that they are supplied by would have to meet our standards but you wouldn't know until the day of harvest as to whether it was coming to us or not. Take carrots for example, the grower can say that they are your carrots over there next to the Wissey, but we don't know that until the day of the harvest because it may be that when they look at the programme they might say no we aren't going to harvest from over there. Or in the case of business to business, it won't all come to us. So it does mean you have to have a unilateral standard across all of the suppliers.

So you will have a checklist, to say ok a grower is Red Tractor, something else, and XXX it will be just another thing that the growers will have to comply with..

Yeah so, that is what we have to make sure that everything is comparable across the board. Otherwise, it just does everyone's head in.

Speaking to growers, they might say that we are happy to do the bells and whistles, but another retailer also requires tinsel and baubles on the Christmas tree...

But if you are paying for it people will manage, but if you expect the tinsel and baubles for the same price you will be pushing your luck so you will need to understand what you are playing with.

END OF TRANSCRIPT

Interview Transcript #14 – large retailer

November 2018

0:00

Introductions, project explanation, etc.

1:35

I: To start off, would you be able to talk a little bit about what capacity you work with fruit and vegetables?

P: Oh right. So, my responsibility is for the sustainability part of the *[retailer]* business. And when it comes to vegetables, we have a separate business called *[produce business]* which runs a lot of our produce relationships and packing. So, for instance we own our *[vegetable]* packers who are integrated down to that level. And I have very dotted line responsibility into working with – it's not quite a group structure- but working with the sustainability teams and the agronomy teams at *[produce business]*.

I: Ok. So, you work with *[produce business]* and what other kinds of businesses do you work with in terms of fruit and veg supply?

P: Well they are our fruit and veg supplier. We own them. So, it's slightly different where most retailers have a retailer purchaser and maybe even some agronomy and then they're supplied by a pack house relationship to growers. In this instance we're integrated with the pack house.

I: Ok. And they supply you with all the fruit and veg that you need?

P: Yeah. They're their own brand. Obviously if there's any branded products, that's the responsibility of the brand holder, and there are some things like ready meals that won't be our responsibility. They will be *[produce business]*'s responsibility.

I: Why did you decide to have this kind of structure?

P: *[retailer]* highly paid help, I suspect there's something around money involved.

I: OK. And which other businesses in the supply chain would you say affect you most?

P: Sorry I missed that bit.

I: Which other businesses in the supply chain affect you most? What would you say?

P: Well, some of the people like ready meal suppliers, people like that who obviously got fruit and veg as an ingredient as opposed to being a primary product.

I: And so, what do you think would be the main water risks that are affecting you?

P: A combination of water stress and water excess. The volatility of water supply. And how to build resilience to that type of fluctuation within my supply base.

I: Ok. Would you be able to explain that in a little more detail?

P: Yeah. Depends where you want to go with the conversation. So, you can look at it from a longer-term perspective where we're doing work with *[university]* looking at water scarcity metrics and starting to be able to report those *[project details]*. And looking at where water could potentially be a limiting factor. And then down to suppliers who are making investment decisions do go semi-protected to avoid salad leaves being contaminated by heavy waterfall or salad leaves being damaged by slugs in the summer. Which is a damage people tend not to think about but actually is very real.

I: Do you see a big difference in terms of different sourcing countries and regions?

P: Well, look. People are making sensible decisions about access to water for production. So, we're seeing for example our sweet corn supplier is now producing sweet corn out of *[West African country]*. And that's a move away from maybe more vulnerable areas. And certainly,

you see pressure production coming out of the Middle East and going to places like Morocco.

I: Do you incentivise suppliers in any way to think about these things?

P: Depends on how you define incentivise. Do you mean give them support and sponsorship? Yes. Are we handing over hard cash? No.

I: But you're having conversations with them about these issues?

P: Yeah, well. There's always work in mapping water scarcity and coming up with the risk assessment and then using that as a conversation to be had about what they do about it. And that might be that we see people investing in reservoirs for winter rainfall capture, and we see people putting covers on reservoirs to avoid evaporation.

I: Ok. And how do you go about managing water risks?

P: Well, at the moment all of the water risks are based on the supply chain. It's down to them to work out what they need to invest in to ensure that they can deliver. We agree on a program of supply with the growers. We know when we need cauliflowers in September and the volumes, we think we're going to have, and they plant accordingly. But put in some contingency planning in case of changes in the weather or access to irrigation water. That's all part of the service that they provide as part of the contract.

7:25

I: And what strategy do you use to increase your resilience. Say this summer a lot of growers have been affected by unexpected droughts. Do you then expand your supply base or how do you go about it?

P: Well we try to expand the supply base, but this year has been a case in point, what's the right thing that we can do with a summer like this in the UK?

I: Can you repeat that?

P: This year's summer in the UK will be a case in point. I don't think anyone's fancy climate model predicted it this year, did they? And yet we obviously were short of water, production was influenced, production patterns were influenced. And so, we ended up with - late spring for example didn't help with asparagus - so we ended up with a higher additional proportion of production later in the spring than we would have anticipated. But there's nothing you can do. There's no moments of hunting and gathering in produce because it's produced outside and it depends on what weather conditions happen.

I: And so, how flexible are you in your sourcing. Say if you can't get asparagus from your normal producers, can you then look at other markets, or is that complicated?

P: Well you can, but there's always a cost to it. The reality is, there is not a huge amount of speculative production which is out there. Because the cost is so high of growing the field. Most things when they go into the ground have got a destination already agreed. There are a few people that sort of ride the market, but that's not the way that we operate because we have long-term relationships with the growing base and need to be able to access our returns and our volumes are great. You can't go to the nearest wholesale market and buy it.

I: Ok. And how do your relationships with growers look like? Do you have long-term contracts with them or is it more year by year?

P: It depends. Depending on the crop, depending on the level of investment, we're taking a flexible attitude to making sure that we've got the right level of investment and efficiency in the supply base and supply of course. But these aren't hard and fast, because people are in different situations and business cycles, and people who have invested for the future and have more capacity and want to grow their markets. A lot of it comes down to the suppliers' business strategies rather than ours.

10:18

I: To what extent would you say have you actually seen impacts from droughts or floods?

P: I rephrase my answer to the British summer this year. It had a massive influence. And also last year, do you recall there was a late spring cold snap in Spain and sort of iceberg lettuces weren't accessed by some people. As it happened, we weren't affected by that, so we weren't flying in iceberg lettuce from the States, but some people were.

I: Do these experiences somehow change your practices?

P: Sorry?

I: Did you change your practices in any way based on these experiences?

P: No, we just thought, gosh, the weather gods helped us and didn't help somebody else. In the absence of putting everything under a greenhouse, you're exposed to what the weather brings.

I: How about water use for washing and ready meals and pre-processed produce? Do you know about water management in these steps?

P: To be honest that's not something I've looked at. The concentration is more a bit about agricultural production rather than processed production. Mainly because it's pretty well regulated. But we do actually monitor water use intensity in our supply base on food. We have a programme on best practice sharing and data recording and that information is shared amongst the participants in our supply base. So, they can have an idea of our benchmarking and they can see what people are doing about water use efficiency.

I: So, you're not as worried about water in these?

P: Well we are. Because obviously we are recording it, reporting it and highlighting the issue to our supply base.

I: Ok. Have you seen adoption of efficiency measures?

P: To be fair, we have done two years of reporting. So, the cycle should be slightly longer than that to see any major change. So, we see big reductions in waste. On those metrics that we record - water use, waste and energy use. Obviously, waste has been the primary focus, there's pleasing reductions in waste. I'm expecting the water and energy to have similar progress in later years.

I: Waste, do you mean water waste specifically or food waste?

P: Food waste.

I: Ok, food waste. How long do you generally plan into the future? What's your time frame?

P: In this business we are assessing what happens today versus what happened yesterday. So, it can be quite short. So, the climate change models working for 30, 40 years are not part of our timeframe.

I: Ok. So, what would your time frame resemble closer?

P: It varies. But three years is a long time for us.

I: Ok. And so, if the impacts of water related risks would go beyond what you and your suppliers have planned for, what would you do in the short term and in the long-term?

P: Well, the other planning that we have done is we have also looked at climate change risks, not specifically water, but on our infrastructure. Because we build, we used to build lots of big flat buildings to do distributions from. And they tend to be built on nice flat floodplains generated by rivers for us. So, there's a bit of vulnerability there, so we've also done that additional work.

I: So, relocating?

P: No, more in case of highlighting that it's a risk. There's not a huge amount that you can do. You can't build walls around it. But it's a risk, it's a hazard. We simply define the risk and make it such that it becomes something that we would respond to or do something about.

But within our timeframes it's very difficult, because those buildings have been on flood risks now for a decade or two and nothing's happened to them.

I: It's hard to make a business case on a very low probability of happenings.

P: It's the volatility weather I get more traction on because people see that and recognise it. But they're not talking about one-in-two-hundred-year-events which is what the governments want us to plan on. I suspect that most of my senior managers think that means it's going to happen in another 199 years.

I: Do you think that it's going to happen far more frequently? So how often do you expect a summer like this one to happen?

P: Good question! If I knew that, I suspect I wouldn't be sitting at a desk on a Friday morning. I'd like to point out that the Mississippi has been flooding, what, three one-in-two-hundred-year-events in the past 30 years. Probably means that the one-in-two-hundred-year-assessment was wrong. But you have to explain that you can have a one-in-two-hundred-year-event twice in two years. Probability is not an easy thing for people to get their head around.

I: And compared to other issues that you're dealing with in terms of fruit and vegetables, how high does water rank on your list of concerns?

P: It's a high risk, but if you think about consumer purchasing habits and the move to internet shopping, that's a much bigger impact than potential water risks.

I: Why is that?

P: Well, because it's moving faster and it's more impactful.

I: Because online people buy very different things than in the shop?

P: No, just the shift, you just see more and more people buying and shopping online. That's a much bigger retail shift than risk around water. You have to remind people, when was the last time when there was a major empty shelf food crisis in the UK?

I: A long time ago.

P: 1974, when we were short of sugar. So not really a massive water impact. And, you know, against the background of all that time that people have been running to shelves, the supply chains have proved themselves to be able to adapt in access and materials to maintain full shelves. It is difficult to make a case that we've got much of a burning platform. In the time frame on which businesses operate on.

I: Which can be a good thing as well.

P: I'm not so sure if we're able to adapt. So, if you end up with something a bit like this year, you ended up with cauliflowers, broccoli, coming at different times. Yes, you can adapt and can promote to get it consumed rather than wasted. And you could also look at products like avocados and grapes which, you know, have particular challenges in the future and say ok, sense check, whether or not we ought to put all of our avocado production in a particular water scarce area. Rather than being around access to material, that the scrutiny and the people's expectations of us managing natural resources like water means, we need to show ourselves as being good stewards. So, if I'm taking an extreme example, well I'm sort of saying to a supplier to put a desalination plant in so that we can grow avocados in Namibia. I think that's not a good use of natural resources. We ought to be making sure that we grow avocados in areas where there's sufficient water for that crop to be sustained.

I: Yeah. How did the shift towards or away from seasonal consumption affect your planning?

P: Well, it's just a reality. Our consumers want to buy asparagus and strawberries at Christmas. At the end of the day as a retailer we will endeavour to supply what they want to buy.

I: Do you talk to other retailers at all about what they are doing and exchange best practices, these kinds of things?

P: Well, you're in dangerous competitive territory, so that comes down to being concerned with trust legislation. There are things we collaborate on, things like natural capital, hence the water work in which Tim Hess has been involved with. That's a multi retailer working group and suppliers too. There are, as long as it's pre-competitive, there's something to share and work on, other areas because availability is such a key metric in driving retailers, access to materials when other people don't have them is a key competitive advantage.

I: And so, as a business how do you define resilience for yourself?

P: Well, you know, supply.

I: Is your objective mainly to maintain the business model that you have now or be able to adapt to whatever changes are happening?

P: A bit of both. Retailers don't do great on revolutions, we're more evolution. Maintaining where we are and then just making sure that we are adaptable and have got the flexibility to change both in terms of where the consumer is taking us as well as where we need to go with the supply base.

I: Ok. And are there any other strategies for increasing your resilience to water risks that you can think of?

P: The work that we do on soils. Can we improve soils and soil structure? Making soils more resilient to temperature change and both droughts and floods.

I: Are you working with that already or just kind of thinking about doing that?

P: Yes, we've been doing some work on that. We've done work agriculturally, looking at research in the States and we're also doing work with various other parties in the UK.

I: And how does that look like in practice? Do you have a team of technical advisors that go out and talk with farmers?

P: No, we're at the research stage at the moment. So, it's working with researchers and other actors in the supply chain and trying to get information and collaborate.

I: Ok. Are there any water management strategies that you know of but are not using for any reason?

P: Well, I'm slightly sceptical about the people who are talking about their water use. I think it's important that we do, and it's good news that people are talking about water. But you have to turn around and ask how do you measure it? Which is why I'm really interested in the work that we're doing with *[researcher]*. You know, there isn't an easy metric. And there's some people declaring the amount of irrigation water they use. Well if it rains you don't irrigate so that's not really a management practice. You don't have a huge amount of impact on the rain dents. But I think that's one of the things that we do really require from the science base. Tools to be able to evaluate. I think there is a bit of history to get over, because various people have prophesied over their particular approach, which then hasn't necessarily been the best one. Obviously various initiatives come and go on water. So, there's a bit of reserve about where things go. But it needs to happen. We need to have better metrics. Better ways of assessing, better ways of guiding what is the right thing. Am I able to demonstrate the crop that I'm growing in this field, in this area, in this catchment?

I: What would be other factors that limit your capacity to think about or implement water management strategies? Is it more capital or these knowledge and evaluation practices?

P: Well I guess when we start to have an assessment tool then we can start to measure the impact of any interventions. So, it's a little bit of a chicken and an egg. But my personal approach is that we need the assessment which is why we work with *[university]*, I support, and I hope that it will deliver. *[project details]*

24:44

I: Ok. You've been talking about the evaluation and measurement thing which already falls into my next question, but what do you think the system as a whole can do to move towards more resilient water use?

P: Gosh. If I had, have you not got that answer, cause then I'll go and do it. I'm assuming that's the reason why you've got the research project because we don't know the answer.

I: Yeah, but everybody has a different idea so we're trying to hear all the ideas and then put them together.

P: Well, I'm not sure they do to be honest, how long have we been talking about water use? For donkeys' years. We have been talking about green water, brown water, blue water and everything for donkeys' years. None of these things have actually delivered any massive change, have they? So that leads me to the conclusion that we don't really know what we're talking about unfortunately.

I: Are there any practices that you think are really good and shouldn't be changed?

P: Again, I think it's assessments. But I also think some of the statistics that have been used to engage with the public have been really unhelpful. So, turning around and saying a beef burger takes 14000 litres of water is just nuts. These are really distracting, unhelpful. Because you don't engage with the supply base. The farmers think well what I'm going to do, you're just beating me up for no reason, the consumer gets confused by it and we don't end up with a sensible, coherent engagement with the issue. So, I think we need to be much more sensible about the data that's used. There needs to be much better justification. We need to have better numbers to be able to have that conversation.

I: So, in this case, what would you think should have been done?

P: I think we should have been much quicker in turning around and saying, look, that may or may not be true but irrigating corn fields in Texas is certainly not true for UK production. And then the model is not taking into account the fact that the cow is recycling water as well as consuming water, just means, this is partial data it may be reported as scientific but actually it is just being used to push a particular theorem.

I: Ok. Are there groups of people that have different views to you on those issues?

P: Oh, I'm sure, I think *[researcher]* hates everything I say, so don't worry.

I: *[researcher]*?

P: *[researcher]*. *[personal details]*

I: *[personal details]*

P: *[personal details]*

I: In terms of fruit and vegetables, do you think there's more of a consensus?

P: Sorry, on what?

I: Do you think in terms of production there is more of a consensus?

P: Well I think the challenge is actually that it is a conversation that tends to be very environmental. And I get that, it's great to have a focus, but yeah when you got a million people producing horticultural crops for the UK in sub-Saharan Africa, they will probably turn around and say well we've got some strain on water and this is a waste trade review.

I: Ok. I think these were all the main questions that we're asking everybody.

P: Ok. Good luck. Obviously come back to me if you want to.

I: Did you have anything else on your mind that you want to comment?

P: Don't think so. I'm good.

I: Alright. Well then thanks for taking the time to talk. *[personal details]*

P: Very good, take care. Bye.

I: Bye.

Interview Transcript #15 –large retailer

November 2018

0:00

Introductions, project explanation, discussion of outputs etc.

7:25

I: Are you happy with me to record your answers? It will all be anonymised of course, but it's just easier for us to process the information that you provide.

P: Yes, that's fine.

I: Alright. For a start, would you be able to describe a little bit in what capacity you work with fruit and vegetables mainly?

P: Yes, so I work in the *[company name]* responsible sourcing team. Our team works with all the commercial categories in the business, including the produce category. The produce category buys fresh fruit and vegetables. So, I support the produce category on the environmental impact in our supply chain. So usually I work with the produce suppliers on how to minimise carbon emissions from production, how to minimise water impacts, for example runoff of nutrients into water courses, protecting topsoil, and also protecting or enhancing biodiversity at farm level, pollinators or other sort of wildlife. So that's my primary remit. We also look at the risk to the supply from all of the categories but also produce. Produce is probably the most vulnerable. So, we're looking at climate risks and what will climate change mean for the availability and quality for our fruit and vegetables sort of thing in the future.

I: Do you mainly work with producers in the UK or internationally as well?

P: Both. About half of our food comes from abroad, half of it from the UK very roughly. I don't know what the split is for fresh fruit and vegetables. As you can imagine, there's a lot of fruit that comes from overseas and probably more vegetables that come from the UK akin to our temperatures but there is quite a lot of sourcing from overseas. I probably work more with UK suppliers in general because we just have a bigger footprint with UK farmers and suppliers, so overall, it's probably more important to us. But my realm is to look at both.

I: Ok. So what other businesses do you also work with to that extent? Do you work with agents to source or do you mainly source directly from farmers?

P: No, we never source directly from a farmer, almost never. So yes, there will always be, what we will call a first-tier supplier. So, someone who got a packing or processing facility and the product might be getting directly from the farm to that site and then it will be packed or processed and sent to a *[company name]* distribution centre from where we can get it to our stores. So that's sort of the simplest supply chain that we've got. I guess potatoes would be an example for that. You know, you have a potato farmer in the UK somewhere who would grow the potato, probably store them for a while and then send them to three or four processing sites around the country which are owned and managed by our primary potato processor, packer. They will pack it, wash it, clean it, process and whatever they need to do to send it to *[company name]*. So that is a fairly simple supply chain. But there will be other ones that will be more complex. So maybe fruit from Spain or Morocco might be an example where it might be grown in a coop, you know by a fairly small grower as part of a coop. Where it's sort of aggregated and then sent to a supplier, a regional supplier, who then ships or drives it up to the UK to their packing site and then it's sent to us. It somehow varies, but in most cases with fresh fruit and vegetables we have

quite direct links to the growers with those products. So, in a way it's some of the easiest supply chains for us to know exactly where the product is grown, how it's grown and what is going on. Whereas if you think about some of the other products that we supply, whether that's canned products or ready meals, sometimes getting back to grower level is much more difficult.

I: And why is that important for you?

P: Why is what important?

I: To know exactly what grower it was and where it comes from?

P: Well, from an environmental perspective, well not only environmental but a range of quality reasons, it means that you can drive improvements more directly and build that relationship with farmers and work on improvement projects with them, whereas if you don't know where it's coming from or have that relationship it's much more difficult to have leverage and say we would quite like these products to be grown in this way or would like you to use these farming practices or etc. So, you know having a good, transparent supply enables us to work on improvements more directly.

I: Ok. And so you work with farmers in fairly long term or is it more year by year contracts or does it differ a lot by region?

P: Yeah, it differs quite a lot. Over the last years we've established what we call *[name of sustainable farming initiative]* and they cover a lot of different sectors, mainly livestock and protein which I appreciate you're not looking at so I won't spend too long on describing these. But essentially, they are groups of farmers who supply that product. So, milk is a good example, there's about *[number in the high hundreds]* milk farmers in the UK that have contracts with *[company name]*. And that means that we can have quite a long-term relationship with them, whereas we don't have those farming groups I think for any fruits and only some vegetables. And it tends to be the UK only as well. So it's something we're interested in developing and expanding to other regions but it tends to be, you know, our suppliers have quite an important role in determining who the growers and the farmers are, as well as us. It's a bit of a joint effort.

I: What other businesses would you say affect your operations the most?

P: Can you just explain the question?

I: So, thinking about what other business in the supply chain affect you the most? Would it be the intermediaries that you work with or the farmers themselves?

P: When you say affect, what do you mean by that?

I: Who you're dependent on mostly.

P: Well both very much. The supplier tends to be getting the product from A to B and we couldn't be doing it without them. There are also playing an important role in building up the relationship and ensuring the volume is going to be there and warning us if it's not going to be there for certain reasons, you know if there's a weather incident, a heavy rain or something that's damaged a crop. They are often the ones who would be telling us. You know there's problems here. Although we do have local sourcing people who work directly for *[company name]*. I can explain that later. But of course, the farmers, that's the most important person in this because they're actually growing the product so without them we're not going to have anything. So yeah, it's very much a joint effort across the supply chain.

I: What would be the main water risks that you're experiencing in terms of fruit and vegetables?

P: This is a huge question. Well, how do we break this down?

I: Maybe by region?

P: Yeah, we could look at it by that. We've got, so there's sort of water scarcity issues, you see what I mean, where there's literally not enough water. Then there's also the reverse, where there's too much water, and then, so that's almost a supply side of risk which we can unpack in a minute and then we've got another type of risk, or issue, which is almost reputational, which would be more about quality. So, if there's poor water quality in certain regions and that's as a result of agriculture, that could be a business risk to us as well reputationally. So, there's two types of risks. Let's explore the first type first which is sort of more the supply side risk. There are certainly parts of our supply chain that are more drought vulnerable and high risk, xxx South Africa is an obvious example, given that Cape Town almost ran out of water just a couple of, a few weeks ago. So, farms certainly were being, I don't know if threatened is the right word, but the local authorities wouldn't let Cape Town run out of water before the farms, exporting farms would say they're more vulnerable. So, their water supplies will be turned off before the city, sort of a prioritisation perspective. So there are parts of the supply chain that face extreme drought and that's obviously a big risk for us, so Cape Town, xxx is one of those. But there are other parts of the supply chain that are just always quite drought vulnerable. Peru, although that we saw issues there with extreme downpours and flooding which destroyed a lot of areas. But so Peru is one, southern Spain is increasingly an issue, and even the UK we saw this summer. It was an unprecedented length of heat wave and that has affected the supply of certain vegetables.

I: And you would say that drought or water scarcity is more of an issue than floods, heavy rains, too much water?

P: No, not necessarily to be honest. I mean, I think it was only a couple of weeks ago in southern Spain where we, Germany, France, we all get a lot of winter fruit and vegetables from, you know there was heavy downpours and rains and that's impacted the growing in the region. Damaged crop, reduced volumes, a really important time of the year because we're reliant on southern Spain at the moment. So, downpours and heavy rains are a problem as are frosts and snows. So, I think two years ago, winter 2016, again southern Spain had unprecedented rain and snow which meant we had to start rationing certain salads, vegetables and courgettes etc, because we didn't have enough.

I: What were some of the worst impacts that you had due to water risks?

P: Say that question again.

I: What would be the worst impact that you would have experienced due to water risks? Would you at any point not be able to supply a certain type of vegetables or is it just more difficult for you to source it from somewhere else or how do you go about it?

P: It's a combination of all those things. The most extreme issues I guess is that we won't have something on the shelf because there's literally not that volume. You could say from a business risk perspective, although that's bad, if all of our competitors have the same problem, it's not actually the end of the world because, you know, two years ago you could have gone to any supermarket and there wouldn't have been courgettes. Everyone was in the same boat. I'm not saying it's not a problem, because people go to shop, it impacts wider sales, we have to look bigger than just, people aren't just going to the shop to buy fruit and vegetables, but if that's the pull, and fresh fruit and vegetables is a really big part for supermarkets. You know people go there and then they buy other things, so you do need to have that bigger picture on what's the business impact. But you could say that even running out of a product isn't the end of the world in some cases. But more likely is that it's going to impact quality. And that can be a problem because if our competitors or others are getting the same product from different supplies, whether it's different regions or more

resilient farms, different countries and the quality of their products is therefore better as a result, then that's more of a big problem because then it's a, people leave with an impression of [company name] is having poor quality fruit and vegetables. So there might be a lot of blemishes or the shelf life might be poorer, or it might be smaller products because there's not been enough water while growing the vegetable. So that's really hard to kind of quantify at a macro level. So, we could do it product by product, but kind of really getting at a macro level, what's the impact of water related risks on our supply over a given year is very difficult to do actually.

I: What are your main strategies to manage and plan for these risks? You've been talking about working with the farmers and making production more sustainable, or would you be trying to increase the variety of people you source from? So that you can, if you have a problem in southern Spain, then source from Morocco?

P: I would like it to be more the former, because that's what I do in our team, I would like to be having long term relationships with farmers, helping them be more resilient, and work with how they grow things, or their soil management practices, or water harvesting and all of these things. And that is going on, don't get me wrong. But I would say that the main way the business goes about this as I've described earlier is through making sure that we've got a diverse supply, that we have a contingent supply from different parts of the world. That's necessary. So, when these weather instances hit, we can say to our suppliers, or our suppliers can just source from wherever and we don't have an issue. That's in reality the biggest risk management strategy.

I: And how flexible are you in moving from one supplier to another?

P: I think, I mean again it's going to vary by product. I'd say we're pretty flexible, so that example I gave earlier with southern Spain, I think lettuces were being flown in from the United States at some point, xxx, you know which sounds ridiculous from a finance and environmental perspective but it just goes to say about the sourcing power and the flexibility of some of the supermarkets like [company name] have. Because if we need a product on the shelf, we'll get it from anywhere we want. It sounds crazy to think you would go to xxxt to get lettuce but if that's what we'll need, we'll do it. So clearly there's a lot of flexibility there, but it's not ideal, it does come at a financial cost, let alone an environmental cost.

I: Ok. And how would you compare water risks in production to those further up the supply chain, so in washing and food processing, ready meals that you also supply?

P: Clearly those activities are also water intense, but since my time at [company name], I've been here for three years, never one of our sites has been having any water related issues, like you know, having to minimise production because they haven't had water. I think most sites are obviously vulnerable to sort of pollution incidences and fines and things like that if they're poorly managed which they don't tend to be. They tend to be managed very well. But yeah, I've never come across that, so I'd say the higher risk is certainly at farm level.

I: And how far do you plan into the future with the sourcing?

P: I think it varies. I think it can be from, I'd say in general it's the next season. We tend to not have huge time horizons. So up to twelve months is probably the most realistic for most products.

I: In an ideal situation, would you want to be able to plan further ahead or is that sufficient for you?

P: I think some of our suppliers will be planning further ahead than that, there's no doubt about that, because they will, there's known growers and farmers across the world, whatever their product is for many years. I know there's one example. There's this citrus farm which is not in our supply chain yet. But our supplier is doing a lot of work with them in

hopes to bring it into our supply chain in a couple of seasons' time when the trees are established and they're fruiting sufficiently for example. So, with long term products like that where you have to grow the trees and develop them, you know it's not like you just grow the potatoes in the spring and harvest them in the autumn. So, there are certain products where there is a lot longer time planning going on. And these are probably those perennial crops, the fruit trees and the things. But otherwise I'd say it's a bit more of a year to years' time. And there will be reasons for that. It's very complex. There's commercial reasons as well as not wanting to tie ourselves down. It might be beneficial, get a better price to buy from the stock market in certain incidences, we might not want to secure all our volume in advance because we won't know what the weather will be like, there might be demand fluctuations, we have to be flexible in that regard. So, it is quite a complex picture, but I would say that general vegetable products perhaps are just according to market supply.

29:29

I: How do you assess the trade-offs between maintaining that flexibility versus engaging in more long-term contracts with farmers so that they can then make investments that would increase their competitiveness and their environmental practices as well?

P: What was the question?

I: How do you manage these trade-offs between deciding whether it's more important for you to maintain flexibility and be able to buy short-term from the market versus giving farmers more long-term contracts that would give them the means to plan further ahead and invest in more sustainable practices?

P: Again, it's a difficult question. The reality is we're not having a lot of those conversations where we're saying, well we want to be sourcing from you for the next five years and as a result of that we expect you to do XY and Z to improve the resilience of your farm. We have those kinds of contracts and things in place with our big suppliers, but they tend to be on the processing sites. But with individual farmers apart from the ones in those sustainable farming groups that I mentioned earlier, there don't tend to be long-term contracts in place and I don't think that's just [company name] that's generally the way the market works. There's always exceptions, there's always a handful of farmers that probably most companies will be able to say, whether for marketing purposes or just because that's always been the way, we work with this farmer for twenty years or whatever and there are some sectors like dairy where that tends to be the case. But for fruit and vegetables it's a little bit more challenging.

I: Ok. To what extent do you feel like you can influence consumer preference as well? Do you feel like you're mainly just responding to demand or are you influencing demand as well?

P: It's both. There's clearly new trends and appetites of products that consumers watch on television or they just want and there's demand, so we have to get more and more of that particular product. Avocados, you know, were an example a couple of years ago. I think we're still struggling to meet demand for them through our import. But so yeah to some extent the customers drive what we need, but in reality, you know, the variety that we offer also dictates what the people can buy and what their demands will be.

I: In terms of looking more long-term, so if in one supply chain or for one product the impacts of water-related risks would go beyond what you've planned for, we've talked about what happens in the short-term, but what do you think would happen in the long-term? So, if in the long-term for example salad growing won't be feasible anymore in Spain, what do you do?

P: Sorry, xx, you've just cut out for a minute

[back and forth repeating questions and cutting out]

35:18

P: I'm very sorry but we have lost good phone connection and I would have to go in a couple of minutes anyways, so I'm happy for you to pin me the final question via email and I'll try and get back to you, but I'm sorry we won't be able to carry on.

I: Ok, that sounds good.

P: Ok, and sorry again, I hope that was helpful and we can carry on another time.

I: Yes, thank you so much, bye.

P: Bye.

Interview with Retailer Q

Project intro

Int: We are devising a game that we want to get stakeholders to come and play at a workshop early next year, so probably in about March, so I was going to tell you and XXXX about it in case you might be interested in coming along and playing the game?

Q: Yeah, definitely, is that specific to any supply chain or country?

Int: Originally we were going to do two workshops, one, because we are doing a case study in the UK and a case study in South Africa, so we were going to do two workshops in the UK and two workshops in South Africa, but it's worked out a bit differently as the project has progressed, so the idea is to now to try to get domestic UK fruit and veg growers together with representatives of South African fruit imports at the one workshop, because looking at any part of the supply system in isolation doesn't really give us the answers we need, since supermarkets will often be making decisions about whether to source locally or source from further afield, depending on prices and things like that, so, I'll send you some more information.

chatting...

Q: I've got some notes or answers prepared about all the potato questions you've asked and maybe some ideas around how XXXXXXXX's can support water work in the future, where the opportunities are. XXXX's expertise will be much more around historical challenges and the broader market. She, as I said, she sources roots, onions, alliums and brassicas and has worked in loads of other categories in the past, so, she'd have a bit more of a broader understanding of veg in general and a little bit of fruit as well, although I'm not sure if she's sourced fruit yet.

Int: Okay, do you just quickly want to give me a run down of what your job involves and who you work with within XXXXXXXX's and also external organisations.

Q: Yeah. So I work within, I'm an agricultural manager within the agriculture team, so we support, as a team, we support categories within the business, whether that be produce, meat, fish and poultry, can and package, bakery.... all those sort of product-facing categories, we support them with agricultural and agronomy support. So whether that would be the likes of giving some market context, advice around current growing challenges, particularly this year where it's been so dry we've been supporting everyone on what that would mean for the ingredients in their products. A huge range of things from managing our pesticide policy and how that's all managed and tracked, and then a lot around technology and innovation and specifically I work a lot with small sort of new

businesses which are aiming to try and I guess deliver new solutions in agriculture through new technologies, both on the ground and also at maybe, in terms of water, at a catchment level.

Int: So does XXXXXXXXXX's invest in those start-up, new technologies or?

Q: I wouldn't say that we invest in them, but if any of them come to us with ideas we are very happy to sort of hear what they are about and then identify how we can support them, so that might be just putting them in touch with our supply base or growers, or we may want to be involved in trialling their products for example or their service, or we may be able to support with linking, if we think that there's an opportunity around further research, we can link them with access to funding and things like that. I think, unfortunately with a lot of retailers, the budget we have for investing in things is very small, but our network is vast, so that's where probably we can play a key part in those sorts of things.

Int: Yes, so you are kind of talking to people who have new ideas or technology, are you also interacting with growers and packers or?

Q: Yeah, so I guess the technology and innovation side is one part of what we do. We have daily conversations with growers, I guess on a product side, what they directly can supply us, what they need and can supply us, but also longer term what their challenges are, where they might need supporting, just so that, you know, it's important to maintain those relationships just so that we can support each others businesses, and there's no surprises, and try and mitigate risk and manage challenges really.

Int: And does XXXXXXXXXX's prefer relationships that are direct with, so it's with grower groups predominantly or...?

Q: It really varies with product, so a good example is our dairy development group, which has been running for over ten years now, that is a group of about 250-odd dairy farmers, and we would interact with them as a group, because that's a closed system. Other areas within fruits we'll be sourcing directly from growers in South America or South Africa, and we will communicate directly with them, although their product is still packed in the UK, so there's sort of a service provider there but we still communicate directly with them on a full one-to-one basis. In other areas, for example, potatoes, there'll be a group of growers which sort of, can be the most, well growers I guess who want to be engaged, who want to have those sorts of conversations, they might be growers who supply large volumes. They might be growers who grow XXXXXXXXXX's specific varieties, so we'll have a group there which is a good representation of the potato supply base as a whole, but there's too many for us to speak to.

Int: So you'll have key growers?

Q: Exactly.

Int: And in terms of the contracts that you have, are you doing everything on fixed price contracts, is there a preference to do it that way?

Q: Well for potatoes it varies between variety and product area, I suppose. Some products are the variety, like a Maris Piper pack. Some products are white potatoes and they could have... you could put throughout the year a number of different varieties in that pack. So for some of those products we would contract 100%, to ensure that we get the sufficient volume at sufficient quality throughout the year. And we'll do that partly, well, mainly because the market price fluctuates too much, it's a bit uncertain. But also they may be varieties which require greater inputs, more attention to detail, might be harder to grow, so that the incentive is there for the grower because we've committed to them. Erm, whereas in other areas they may be truly a commodity which we might contract 30-40% of what we need for the year just in order to sort of ensure we have some, but free-buy the rest of it.

Int: That would be more the white potatoes then?

Q: Exactly, yeah, erm, and I don't know for certain but probably for other areas, well XXXX will be able to tell you for certain, but all her areas contract 100%, erm, but there might be other areas, for example wheat. Wheat is free-but I think all of it, so it does vary between product groups.

Int: Okay, so in those circumstances where you do have let's say for salad potatoes, or particular cultivars of potatoes, you have a fixed price contract, are those mostly with growers themselves, like direct with an individual grower, or with a grower group, or with a packer?

Q: Again, it varies by product, for potatoes it's with the packer, so with XXXXXXXXXX's there's two main potato suppliers, potato packers, and we will contract with them how much we need and through them there'll be an approved list of growers, which we've approved, and they will go out to them and source what they need. For other areas they might contract directly with the growers.

Int: And what determines who's on the list of approved growers or not?

Q: So there's a checklist, mainly around, they need to have the correct certification. So in the UK at minimum standard we have Red Tractor or, Global Gap internationally. There'll be questions around their ethical status, so the workforce they employ, pesticide records, so their control of those records. Part of signing up to be a grower is that they agree to our pesticide approval list, so we

have approved pesticides, we have an amber list, which may require derogations, and we have a red, banned list. So they'll agree that they need to adhere to those rules, those sorts of things. They sign up to meet XXXXXXXXX's specifications, which can be flexible, but loosely there's a spec. Those sorts of things I suppose is what... in order to be an approved grower.

Int: So with the contracts, this is a question that Joanne, who is designing the questionnaire, wanted me to ask, what's the contract structure, what is specified, basically, on the contracts that you would have? And then I mean, I suppose you've got the approved grower's list already, which specifies a certain amount, so when you have the contract with the packers, what does that specify? I'm quite interested in quality, but also anything else.

Q: Erm, it's not my area of expertise, but it will be around meeting specification, meeting required volumes, but also more broadly around service delivery times, so if we are requiring a product to be delivered to our depots at a certain time, they commit to that, that will be part of their contract.

Int: So on the technology side, you are dealing with specialist agricultural knowledge, so is it a different part of XXXXXXXXX's that deals with contracts?

Q: Yeah, that would be buyers, so buyers will manage all that. I guess broadly they manage the commercial side and legal contract side of that, and the likes of myself and XXXX will manage the more technical agronomy, quality focussed side of it, and in a product team there would be, so the buyer, technical and then a supply chain person who purely is managing how much we need each day of that product.

Int: And so is it people like you and XXXX who decide what the quality specifications should be? Or is it the...

Q: Yeah, it's a team effort, but ultimately we are responsible for writing those specs and agreeing them with the suppliers, and also, if they need to be amended in any way, we're the ones who would I guess negotiate that and work out what is best for the grower so that they can actually market their product, what's best for XXXXXXXXX's so that we can maintain availability, but also, probably most importantly, what is best for our customers. We don't want to give them a poor product, a worse-off product, if we don't need to.

Int: So would a time when a contract was amended be if the grower or the packer was unable to deliver on that contract you would then amend it?

Q: Well, potentially, yeah. It's never a sort of definite and this season with the growing challenges is a good example where it is likely we will need to amend specifications because there just isn't the, it

doesn't look like there will be the required volumes at the existing specification, so erm, we can change things like, on potatoes you can change things like the tolerance on skin defects or the size, which goes into a pack, to release more product onto the market.

Int: So things may be amended, but there's still a level below which you are not prepared to accept under these amended.

Q: Yeah, I guess that's where it comes down to your product knowledge and where the product sits within how we categorize them, so for something like a lot of veg, and particularly XXXX's areas, and potatoes, is that it's a commodity area, so we would be looking to match quality to I guess the rest of the market, particularly xxx and xxx. So if everyone suddenly moved on a certain product for the size banding in order to secure availability, it gives us justification for doing the same, but then there'll be other areas, which are probably higher value products, some areas of fruit or floral etc where by not being the same as our competition that's our distinctive element and that's why customers come and shop with us, so we may be much harder to negotiate with to change specifications, because the reason we sell that product is that it is at a standard, and there's bigger implications for moving that standard. Indeed it's never one person's decision, it's never just a XXXXXXXXX's decision, it's always in partnership with the supplier, because it needs to work for them as well.

Int: So the specs will be across the board, XXXXXXXXX's will have its specifications for how it wants Maris Pipers to be within a certain season? You wouldn't allow certain things from some growers on the basis that they had been differently impacted?

Q: Well.... that's a question for XXXX because I'm not fully up to date. In the past we used to have temp specs, so temporary specifications, in order to meet availability we may, for a small percentage of crop, accept a higher tolerance of skin defect, for example, so on those sorts of basis, yes, but probably not down to the individual grower, like we would never know it was because of... you know, Joe Blogg's issues, we wouldn't know it was him, but.

Int: But you'd allow a percentage in?

Q: Yes, the supplier would approach us and say, "we need to have a slight tolerance on this in order to maintain availability"

Int: What do you expect to be changed to specifications on the basis of the hot weather that we've just had?

Q: Well, it really depends on the product.

Int: Just based on potatoes, although there's lots of different types of potatoes I suppose!

Q: Yes, generally across all different types of veg this year the lack of moisture means lower yield, but then the knock-on effects in terms of quality are sort of unknown at this stage. For potatoes specifically we are expecting the general size of the crop to be smaller, so that potentially means there's challenges, you know when we specifically sell a pack of baking potatoes which customers know are a certain size, what are the implications of putting smaller potatoes in there. Those sorts of things we are looking at the moment.

And then with both potatoes, and various areas, where there is the continuous supply of veg throughout the year, some of it is stored, and some of it is growing now to be used throughout the year. Brussel sprouts, is a good example, where we know there is going to be issues already now, with availability of those products.

Int: With products like potatoes, does XXXXX's aim to, obviously there are lots of potatoes grown in the UK, is there a preference to sell domestically grown potatoes? And at what point what is the decision process to source from elsewhere?

Q: We have made a commitment to source British because that is what customers have asked us to do. So potatoes are a good example where you can, for 95% of the year, for all products source products (in a normal year). So a year like this, and being August, we don't fully know what shortages there will be by April, May, June next year so we are looking at if the volume and checking the specification to see if in theory we can accept a smaller product, that customers wouldn't expect, or we go to places like Israel or Egypt and import. But the cost of that is vast. So it is less of a challenge for me in the Agriculture Team, that would be something for the commercial buyer focused within the produce team. In that sort of challenge, they would weigh up whether or not it was worth committing to 6 weeks of Israel crop at £400 per tonne, or continuing to try maintaining British products on the shelf, but to the potential detriment to our customers.

Int: In that circumstance, does that price penalty get absorbed by XXXXX's or does it get passed onto the farmers because they weren't able to meet their contracted amount? How does that work?

Q: It would be absorbed by us.

Int: So, there wouldn't be any case where you would ask packers to make up any shortfall in what they have delivered?

Q: We may ask them to source them, because they are the experts in where to source them and where is growing best etc. so we rely on them for that advice, but on the commercial side we have to fork out the money for the produce. But then the challenge is to try not to pass that cost onto the customer and particularly in commodity areas where customers are used to paying a low price, if the price shoots up £1 or £1.50 they will show that they are not happy – but just not buying them. So it hurts the category. So it is a difficult decision to make.

Int: With the growers who have had a really bad season, who haven't been able to deliver on the contracts that were agreed, they are losing out because they are obviously not getting paid, because they haven't delivered, but they are not being penalised beyond that?

Q: No, they are not being penalised, but if they have poorer quality than what they were aiming for, say the retail spec, then there is always another market for that product, for example, processing, the outlets are numerous, but the prices may not match what they have budgeted for.

Int: But there isn't a contract penalty?

Q: No, not that I am aware of.

Q: Your project is mainly about water use, I just wanted to say that one of the biggest challenges is with Maris Piper, because it is by far the top selling by volume product, but it is a variety that is particularly susceptible to common scab, which requires a lot of water to control. So from a sustainability, inputs, and cost point of view, it is a very challenging product to grow and as an industry we are going to have to face up to in the next couple of years, particularly if we have more years like this one – to take water away from other crops in order to keep Maris Piper without scab doesn't feel like the right things to do – it doesn't feel right.

And that is part of what has led to a shortage of white potatoes this year, because farmers have decided to irrigate Maris Pipers instead, because they have to look bright and shiny.

So that is a big challenge, and we want to move customers away from Maris Piper to varieties that taste better and which are more efficient to grow.

Int: How would you go about doing that?

Q: Ask me in a couple of years (laughs). It is difficult, because there is a brand around Maris Piper, and lots of fish and chip shops are based on using Maris Piper. It is also a potato that can be used either for retail or in chips as well – so it has multi uses and growers quite like growing because there will always be a market for it. But from a sustainability point of view it is rather concerning. How much water it needs.

END OF TRANSCRIPT

Interview Transcript #17 – Public environment group

Interview Date: 26.11.2018

0:00

Introductions, project explanation, etc.

3:57

J: So, I work in the environment and business, water resources team, that I guess is like a policy team really in the [our organisation name]. We work very closely with [government organisation] as our sponsoring government department. But we also work very closely with our operation people in areas on the ground. I work for [name of person] who is going to join the last call and I am looking at, in particular, the national framework, is that something you've heard of in water resources?

T: Yes.

J: Great, so we're working with [academic] on that, because [academic]'s team develops a national model of water supply and infrastructure, I guess, and through the WAS-net modelling platform. And we are working with him to use that platform in concert with another one that's been developed in the University of xxx to really understand the challenges around water availability in the future. So across England, how much water are we going to need, when, under which climate and demand management scenarios? All public water supplies, but also outside the water industry. So I've got another project that we're just in the process of awarding a contract for, which is looking to better understand demand, future water demand from all different water users. So that would include direct abstractions of water like agriculture, horticulture, energy generation, industry, all of that. Because we want to understand, when we put it all together, what are the future risks of water and what do we therefore need to see coming forward in the water companies' water resource management plans. So we will in December 2019 after having done all this modelling work, we will publish expectations of water companies and regional water resources groups about what we want to see coming through in the next round of water resource management plan based on the evidence that we have developed. So we are kind of setting out our expectations in advance and then when we review the plans when they come in, we're gonna use that to challenge that the plans are ambitious enough. So that's kind of my project and that's a new focus for the [our organisation name]. It's not something we've done in recent years. And it will move us from a position where we're largely auditing the processes of water resource management plans and work together and use it to move it away from auditing the processes to actually looking whether the outcomes are right and whether they are ambitious enough.

T: That's great. How did this change of approach come about?

J: I think it's really a realisation that it's missing. So I think [name of person] has shown quite a lot of leadership in this area and he came into water resources and there's all sorts of issues. And then this isn't going to be credited to us specifically, I'll be perfectly frank. But one of the issues is around the idgeon in [location] England, chalk stream and the southern water abstractions and there are big sustainability issues with the abstraction from the river. And there are all sorts of alternatives but I think there's a feeling that we have a problem with nearly all the alternatives. What we don't necessarily know is what the right thing is and

I think that's where we need to get to. We need to get to a much clearer idea of what does need to happen. And what could be the environmental trade-offs and to make sure there is a strategic plan for the South East in particular. And that's not just [our organisation name]'s role, we're doing lots of work with others and in particular with regional planning groups who are going to be really important for that. But, you know, I think that's part of the realisation. And another part is, when we review the water company's plans, I was involved in writing up our advice to the government. And a lot of what the technical people were focusing on, was very much on the methodologies used, and so we end up with a critique of the technical approaches used to assess the deployable outputs or the technical approaches to groundwater modelling. But what we didn't really have, is a clear feel of, ok, when you put those technical issues aside, are the plans ambitious enough? Are enough of the right sorts of things coming forward? And we didn't have ready answers to those questions this time around. And I think we need to have those answers as we advise governments on the water resource plans.

T: Ok. And do you feel like you're on time with doing that or do you feel like the UK is already becoming rather water stressed in general?

J: I feel that there are very familiar risks that we've known about for a very long time and I think there's a general feeling that a lot, quite a lot of things are on reducing demand and quite a lot has been done to improve connectivity between companies and even more within companies, water companies, but we probably haven't had quite enough of the big stuff since privatisation I don't think there's been any new major reservoirs built, and it feels like with the pressures that are coming our way, we will need to invest in bigger infrastructure at some point as well as water demand and now we have, now we need to make sure that that investment is the right investment. And so I think we are maybe a bit late but I don't think we're too late. But we just need to get that understanding as soon as possible to adapt the next round of plans.

T: Ok. So to what extent have you worked with horticulture in particular?

J: Horticulture, we haven't worked with horticulture so far on my particular project. But we have worked quite closely with horticulture on many other projects. So last year I worked for [government agency] and I wrote the water abstraction plan. And as part of the water abstraction reform, we have been engaged with the [trade association group] through [name of person]. So many many years of abstraction reform, and my understanding is water use for these guys is really really important because a lot of them are undercover, they're growing under cover and they absolutely need the water. And interruptions can have really really big effects on outputs and they can lose their crops for want of a better word. So that has been a focus and one particular challenge is around the trickle irrigators. Currently trickle irrigators are exempt from water abstraction licence but are to be brought in. And we've done a lot of work with [trade association groups] to work out how best to do that. And it's a really challenging policy area because basically because they've been exempt from abstraction licencing, some of them are operating in catchments where there is no extra water available to be taken. So if they were to just apply, any other abstracter to just apply for a licence, we probably would say you cant have one or you have to have one with really restricted controls. But the fact is that they have been operating already. So what we have been working on with the government is to bring them into regulating, that actually recognises sort of that they're operating already, and therefore they are an exempt abstractor. So what's being done is trying to process where we're bringing them in and give them a quantity of water in a licence which reflects how much they've used in the past. To recognise that they have been operating, but not to be able to give them everything they

want in the future. And a lot of the soft fruit growers in particular, are a thriving industry as I understand it and are increasing outputs quite significantly and have done it in previous years. So, by giving them historic usage they will then have an issue to then not have water to then expand and develop unless they get more efficient. So that's a really big issue for them. What we've been doing is trying to find those particular crunch points in those locations and see if there's anything that can be done in terms of bringing in the water companies. So for example in the [South England council] I know we looked at the potential to expand one of the reservoirs of the company which the company is looking to do anyways in order to then supply more water for the soft fruit growers downstream in the [South England area]. So I think that's one potential area to explore, kind of build water company resources slightly bigger to help meet these unmet demands from fruit growers.

T: One point that a lot of the growers we've been talking to have been raising is that they would like to receive financial support to build reservoirs on their farms. Do you think this is likely to happen at some point or would that be difficult?

J: So I think there are some grants available at the moment for reservoir development and I know that we have certainly published information to support it. I've always seen it more as the kind of big irrigation [in the East of England] that potatoes and the carrots need rather than necessary horticulture which tend to have boreholes. But that is interesting feedback and I can see how they would certainly benefit from that.

T: Yeah, I guess the larger horticultural producers that we've been talking to, a lot of them already have reservoirs and the smaller ones that don't have any really, and then if they don't have access to some other form of water abstraction then they've had quite big problems this summer or just kind of getting through the summer but having to abandon some crops in some fields. And so a lot of them have said how they are starting to think about whether they should be investing in a reservoir but they also don't know how the forecasting is. How likely it is to have more dry summers like this and whether an investment would be justified or not. So there's quite a lot of uncertainty that they're facing at the moment.

J: That's interesting, isn't it. Because of course the government doesn't want to subsidise things which should happen anyway. I think there's a feeling that some of these soft fruit growers in particular have really high value outputs. So it's interesting, this point about is it cost effective to then develop these reservoirs themselves given that the added value is presumably quite high from the water. Whereas I think what we hear from potato growers for example is that the economics doesn't quite stack up so much, so that's where they ask for government support. I'd be interested in your views on that, on the economic side of it.

T: I haven't looked too much into the economic side of it, you know how much it costs and for what kind of scale it would be feasible. But yeah, I got the feeling that people would be willing to invest in it if they knew that a dry summer like this will be coming up every four, five years or so, but they just fear that they would be investing in a big reservoir now but then have ten years of rainy summers and then not get the financial return.

J: I hear that, so it's the uncertainty around the future that is the challenge.

18:28

T: Yes, and about how climate is actually going to change. So, what do you define as the key water risks that affect fruit and vegetable growers here?

J: The key water risks for fruit and vegetables did you say, sorry, the line's not great?

T: Yes.

J: So I think, you know, I think we have already been talking about one of the main ones, which is climate change. What will climate change do to I guess temperature is an important factor, evapotranspiration. What's going to be the difference in rainfall? How are we going to see, what changes are we going to see in flow regimes? So for example are we going to see bigger storm events and then longer drier periods and so climate being a really important part? Another one is regulatory risks around moving to a position where trickle irrigation is outside of regulation to being inside. So that's a particular risk in terms of if they come in and they're kept and they can't develop further. Or what's even worse is if they miss the window to apply within the two years and they actually revert that and treat them as a new abstractor without the more favourable terms, that's an even bigger risk for them. That's a regulatory risk. Then there's an environmental risk which is linked with how there might be need for changes to water extraction volumes over time not just to reflect the changing climate and flows, but also to reflect changing environmental aspirations and our improving understanding of environmental needs and the links between flow and ecology for example. So those are kind of the three, I would say. And then of course there is always a huge uncertainty around EU-exit at the moment. And I think that's an industry that's potentially quite vulnerable to that, maybe not water risks so much but labour risks.

T: Do you feel like drought or water scarcity is more of a problem than floods and heavy rains or would you see that as comparable?

J: I think it depends on the sector. My gut feel would be that the droughts, the drought risk is a bigger one for the high value soft fruit and that flooding is a huge one for agriculture because it can hit yields even more than drier weather. So I guess it depends slightly on the sector, but of course there's also a huge amount of uncertainty around what that will be in the future. I think it would vary quite a lot locally as well depending on the geology in the location, the specific location and the individual businesses according to their risk.

T: And do you have any understanding of further up the supply chain in food processing and washing, of fruit and vegetables and also in the food service sector how water use is developing there?

J: I don't. No. I'd be very interested in anything you find out about that.

T: Ok. So you mainly work with agricultural use.

J: Yeah, I mean, I guess, our businesses, we are responsible for licencing, abstraction and making sure there is enough for the environment and for society. So our focus is around water abstraction and then there's also the focus on the public water supply which we also regulate, the water industry. So I guess those are our two main points. I don't have a huge amount of insights about what's going on elsewhere in the supply chain.

T: How do you then try to give weight to the different types of risks that you identify? In terms of how you're going to address them in the future and the issues that amplify them?

J: Well, we have our science teams working with the academic community on related scenarios. And working hard on those to better understand that side of things. We have ecologists and hydro-ecologists working on the relationship, improving our understanding of the relationship between flow and ecology. We have obviously the national framework which I'm working on which is looking at the macro scale, whole England level risks for water resources and looking to develop a model which will allow us to change climate scenarios to change population, change environmental scenarios so we can see what the trade-offs are and what different options come through for the future so that we can better understand the risks and better understand the cost. So that we can give better advice to the government on the plans that are being developed.

T: Ok. One question that I had and I've been asking around here, but do you know how winter abstraction influences ecosystems? So what farmers say is that in the winter you have all this extra water that you can abstract and store, and it's kind of water that just flows down the stream into the sea and doesn't really have any value so they might as well store it. But are there any ecosystem services that are based on this extra water?

J: Yeah. I mean it varies, this is an oversimplification. It's not a case that in the winter it's all just completely spare water getting lost to sea. The environment needs water in the winter as well and there is more of it but it doesn't mean that it can just be taken freely. There is certainly more available but there are important functions such as flushing the ecosystems through. So we know that high flows are really important for ecosystems to kind of flush through. I'm not a hydrologist but I hear people talk about moving gravel and that sort of thing to create habitats. So high flows are important. But I think the point is that some of the high flows are so that the thoughts of magnitude of abstraction that the farmers would probably be talking about probably wouldn't influence the peaks that much in those cases. So what the farmers are saying in that case I would say is partially right in that there is more water available, but it's just not as simple as let's go crazy and take it all. It's still important but I think that we should, having said all that, we should try to incentivise people to take water when it is available and store it. And I think that is a really important part of the solution. And then that's all just talking about rivers. Then there's groundwater which wherever I talk to hydrologists, they're always impressed by the complexity of individual aquifers, so I don't like to generalise. But I think, you know, sometimes it might be possible to take extra water from the aquifers in winter. Because of the buffering effect, taking water in winter can actually reduce the support that streams get in summer when it's taken from aquifers. So I think the lag times make it more complicated on the groundwater side.

T: Ok. What would be your definition of a resilient water supply? How do you view the concept of resilience in general?

J: I think it's really the ability to keep on meeting the demands, the understood demands that are placed on the system under a range of foreseeable circumstances. So it's helpful to understand in detail the demand that you need from the system and then to really explore the sources of the circumstances that the system could be faced with and to make sure that you have the resilience in the system to meet it. So when we look at a one in two hundred year drought event or 1/500 year drought event in the water industry, that's something that the NIC was calling for. Resilience to 1 in 500 events. I think there's also an alternative way of looking at it which is rather than designing systems to fail in a kind of extreme event, you then compare the costs of the failure with the costs of investment and then kind of come to an optimum level. When you scale that up for the water industry, what you see is that the cost of failure is so enormous that almost every amount of investment to avoid them seems to make sense, and that's what the NIC effectively came to. They tried to look at the cost of supply interruptions in, say under a level four restriction which is stand pipes and rota cups. And the cost of that was just enormous, it's just really something that you don't ever want. And that's why they were pushing greater investments for resilience in the water supply sector.

T: And then how do you measure and monitor resilience in the system?

J: I don't know really. I think resilience is kind of a tricky term, because what I just told you about resilience is quite supply focused. If you were to talk to Ofwat, they would talk about resilience in the route, business resilience, skills, resilience, environment, yeah everything, which I find quite confusing. But within all of that there's a huge amount of stuff that you can measure. But in terms of the drought, how do you measure a report on that? You know,

what you see is that most years it seems to basically be fine. And then I guess you're then, because you can wait, you're then in the world modelling projection so you then fall back on modelling scenarios to test the resilience of your systems. So I don't know if that's a good answer, but I don't think I have a very good answer I'm afraid.

T: Ok. How would you say the understanding of resilience that you have influenced future planning and water management strategies?

J: Well, how we are going to influence future water management and planning?

T: Yeah, based on your understanding of resilience and the ideal situation that you are aiming for.

J: Yeah. Well I think I have spoken about this already, but maybe under a different heading. So I think that mainly we influence the water industry in particular in resilience, is setting out our expectations of them as environmental regulator and we will do that through the water resources national framework where it would set out what we expect them to achieve and that will be based on our own understanding that we have built through our own modelling and it will also be based on the NIC analysis and so that's how we're going to influence that. And when they then pull together their plans and submit them, we will be reviewing them to make sure that they're in line with the expectations that we set out. I think outside the water industry it's actually more challenging and there's many many more water abstractors to engage with and it's a much, much bigger task. One of the things that we will be asking the water companies to do, is, through their regional groups, is to engage with these abstractors and then engage with the catchment work that is going on. So that's one way of reaching them. There's also the priority catchments that we set up as part of the abstraction plan where we're going to be working with abstractors to try to improve the access to water. And one of the things that we can be doing on those occasions is for example looking at how we can make better use of winter river flows and then encouraging storage. But it is more of a challenge to engage with water users outside the water industry certainly. Because there are so many and so varied.

T: What do you mean by the water industry?

J: Water companies.

T: Water companies, ok. Do you think there's any kind of key water events in the past that have significantly impacted the current approach?

J: Water events?

T: Yeah. Or is it more of a cumulative process?

J: Oh, it's both. But the most influential events are always the droughts. So the 95, 96 Yorkshire droughts effectively gave birth to the water resource management plan and process, because it turned out the [North England] water infrastructure was not anywhere near as resilient as it should have been. So that's really what brought up the planning process that we have now. And all subsequent droughts have kind of had various knock-on effects. I think that is the most dramatic, 76, carved into everybody's memory or folklore. Actually, some of the focus that we're able to bring to this problem at the moment is because of the weather that we had had this year in the North West in particular and last year in the South East. Because last year it did look quite bad actually drought wise and that always brings with it elliptical focus which makes it easier to get things done. And I think some of that has led to the high profile that the national infrastructure commission report has received. So it was a good time for that report and it has cleared the ways for some of the things that we're pushing which is much greater regional water resource planning, collaboration between companies and cross-sector working and it's also kind of cleared the

paths of the national framework that we're developing. So droughts are always helpful certainly.

T: And then to what extent do you actually have these stakeholder engagement activities and how often or how much do you reach out to farmers as well? How do these processes work?

J: So, bear in mind that I'm in the national team. But we work very closely with the NFU and the CLA. So I'm not so much now, but I'm working on the water industry side, but certainly on the abstraction side I would speak with [name] of the NFU most weeks about various things going on. So we talk with them very very closely, particularly around when we need to make sustainability changes. We have a group called, you may even be part of it, the water for food group, which I think it's every six weeks or so, has a potato council, gosh I can't remember all of it, UEA is certainly involved. And the horticulture xxx association and some farmers from [North England]. So it's actually quite a big group and we probably speak with them every six weeks or so. And then at the local level, there's similar engagement with the local work canters. And you tend to find that there are key individuals in the agricultural community that emerge and that we can engage with and who then talk to others. Because it's obviously really challenging to get to all of them. And then I guess the other tier of work that we have is through our enforcement activity. So, we have environment officers on the ground, who visit farms for all sorts of reasons, but one of the reasons is where they have water abstraction licences and they visit them to make sure that they're not using too much water. They're monitoring how much they're using. They hear about how their access to water is, particularly where there's groundwater, how the levels are doing, water quality issues, all of that stuff. So there's a really local environment officer type engagement. And then at my national tier of work there's engagement that tends to be with individuals and with the national farmers union, CSA and HTA.

T: And then for making actual policy and informing it, you work very closely with Defra as well?

J: Yes. So we advise Defra on policy and so this is when I was working, meeting [name] most weeks from the NFU and when I was working on the water abstraction plan, and the nature that we thought through the agricultural side of the bill, was actually quite close working there. I actually had a session with a couple of guys who came to see us from Lincolnshire and it was a very thought provoking discussion, I couldn't tell their names because it was 18 months ago or more, but they were doing lots of engagement with farmers that are right at the low water use end of things. And they were finding a huge lack of awareness around water and farms. And they were actually going to lots of farms who take their water from the public water supply and have been hostage to water bills when they could be directly abstracting and just found that there was very very little thought locally from those farmers around water use. And things like they'd go and visit, they went to visit a farm that had been passed down from generation to generation. And they had these huge water bills from the water company. They were looking to see if there was any way they could get water. And walking around the farmer and having a look, so there's a stream but there wasn't much in it. Apparently the grandfather came out of the farm house and just said, oh, there's a well under there and gestured to this concrete area, and the third generation farmer had absolutely no idea at all. So there was actually a well that they could have just rehabilitated. So I think it's not high up on the list of priorities in all cases.

T: Would a farm then need a licence for that kind of abstraction too or could they just use that well?

J: Well they would need a licence if they took more than 20 cubic meters a day. So that's a threshold and you don't need it below that.

T: Alright. So you do have your ways...because when you talk to farmers, for many of them the EA is quite this abstract organisation that's very bureaucratic for them, and the narrative is that the EA comes with these licence policies and they just have to do it, but from their perspective it doesn't sound like there's much of a dialogue. But I guess it goes through other organisations as well.

J: Yeah.

T: So kind of thinking about how water management will be changed or adapted for increasing future resilience. What aspects do you think should be maintained and what might be changed?

43:25

J: So how do we increase future resilience?

T: Yeah what features of the fruit and vegetable systems do you think should be maintained in the future and what might be changed?

J: I think, one of the things that I think needs to be built on is the use of groundwater as a way of providing reliable supplies to clear low flows when there's a buffer capacity which means that you can protect low surface water flows. Increasing storage as well, so I talked about it already, but on farm storage has a big role to play. I think cross-sector working is going to be really important because we have a big disparity here between the nature of these water users. You might have a few farmers who have so little time or resources to think about water and then you have big water companies who have whole teams of people dedicated to it and it's their day job. Some of those people, the water industry can deliver things that the farmer couldn't, so I think cross-sector working is really important. And I think not just cross-sector but also cross-discipline. As far as the things that I found is that there are sometimes opportunities to join up our water management where it's been primarily for flood management but there's potential water resources wins. So I think working across disciplines and joining people up who are thinking about the same things but from different angles is going to be really important. I think one of the examples about it is the [South of England], the [South of England] Water Management project, but there's an IDB, internal drainage board towards the bottom of the catchment that was pumping a lot of freshwater out to sea for flood risk management benefits. But actually, on the way out to sea it was doing some damage to a fort marsh but there was potential to use that water to pump a bank upstream into storage rather than out to sea. So that was being thought about from a flood risk management perspective and a sensible thing was being done from that perspective, but there were also people who needed more water for irrigation, and those communities didn't necessarily join up. And so I think that is going to be really really important. To find those win-wins.

T: Who would be this kind of work to bring different groups together? Would that be part of your job?

J: Yeah, it is part of our job. So one of the things that we've committed to in the water abstraction plan is to look at store priority catchments, by, I can't remember what the timing was actually it's not my lead area, but in the next few years. And then to expand that out. So we want to take a catchment approach to this. By a catchment approach I mean not only from a water resources perspective but much broader. And we want to look into the catchments that we think have the biggest water issues and get people together to work out what the most sensible thing to do about it is. It's a big task, but the proposed way of

working is there's a catchment-based approach CABER group that's been set up to focus on water resources which we chair with a trust. And that's about how we join things up in catchments and find the useful solutions. But we'll certainly be telling the water industry as well, the water companies, that we expect them to be engaging in this.

T: to what extent do you think it's actually in the interest of water companies to advise farms on lower water use, because they might want to maintain high water use in farms.

J: So there was previously a bit of a disincentive for water companies to engage with people on reducing demand because obviously then they use less on their meters and there will be less revenue. But I think that has been corrected with the revenue correction mechanism and in Ofwat, I don't know the details of the revenue correction mechanism, but I think it has been put in place to address that specific point. And I think also that if the water company can reduce demand to the point where it doesn't have to build something extra or where it can build something extra a bit later, then that has a financial benefit to the water company. But I think also some of the investors in water companies want to see them doing the right thing. Earning their role as a monopoly provider. And I think also there's quite a lot of pressure on the water companies at the moment to be doing that because obviously one thing that happened and we haven't touched on so far is that there's this whole legitimacy debate about the water industry itself as a privatised industry, so they're much under siege at the moment with this whole nationalisation question. So companies are looking to demonstrate that they are out there doing the right thing.

49:54:

T: And you think they are?

J : I think they're going in the right direction.

T: Ok. Are there any other stakeholders you think that could do important work to increase the resilience to water related risks in horticulture?

J: Yeah. So I think the NGOs have a really important role to play in the catchment focus. And actually, some of the local NGOs in particular can achieve quite a lot. By being involved. I was always struck by this example of the water supply for Swindon which comes largely from chalk streams and Thames Water were trying to reduce demand in Swindon. They had this whole campaign planned, saving water in your shower and in your gas bills and all of that. And it wasn't, I don't think it was terribly successful, they got the local rivertrust to do a campaign that was actually all about where the water comes from. They were able to deliver it in a very lean, agile way and really got into schools, got into the community because they have those community links already. Got people to really understand where their water was coming from. So I think actually that, kind of the really local flavour is very important in this whole debate. Then obviously there's kind of industry and electricity generation which are big water users which can have a big impact locally. Who will be part of the solution as well.

T: In terms of farms, so we've been talking about both ways, how there's a lot of farmers who haven't really been thinking about water management at all and others who are quite involved. So how prepared do you feel the horticultural sector is overall to think about water management and using it more efficiently?

J: I think they are probably on a learning curve. I think a lot of them haven't really had to think about it too much for a long time. And I think they are realising that they have to start thinking about it a lot more. And I think it's very very variable between them. In terms of where they are and I do worry that it's still not high enough and I worry that they, that some of them particularly trickle irrigators who are outside of the system won't apply to their licences in time and will then get stuck with quite challenging conditions in the future. But I

have to say that I'm not, my current role doesn't really bring me into particularly close contact with that sector. And so I'm not up to the minute on where they are, I guess.

T: Yeah. And then for the future, do you feel like it's mostly important to create more efficiencies around water use, so reduce irrigation? You know, what would be your objective for the future? To maintain the farmers where they are now in terms of their water use or also to have a relatively large increase in horticultural production within the UK and then look at how to redistribute water in that sense, or how would you like to see the food system develop?

J: I think it's about facilitating access to water that the sector needs. I don't think, there certainly isn't a grand plan at the moment in terms of how much the sector is going to need and how its going to be provided. I would like to understand future demand better and I think we can do that partly through the project that we got planned that is looking at specifically that. I would like the barriers that are currently in place to getting the water they need to be removed, and I think that that has a lot of people with a lot of different roles in it and it includes water companies as I said in terms of investing in schemes that can be beneficial for their customers directly, but also to taking a wider perspective so that they can supply water to others. I think there's potentially also a role for policy as we talked around reservoirs, I think there is a role for continued demand management. Because if these companies are going to grow and expand their water use, they need to make sure it's being done efficiently. So the water shouldn't be too easy and too cheap. The access to water has to somehow incentivise them to use that water efficiently as well.

T: What kinds of timeframes do you plan for in your models?

J: I think we're going to be looking to 2050.

T: So quite far ahead. And what other groups of people do you think would have quite a different understanding of you and your group?

J: A different understanding of what?

T: Of the water risks and water management practices?

J: I think there's a fairly good degree of consensus really. I think there's consensus on the challenges but I don't think there's the consensus on the response so much. Particularly I would say around the environmental element of it. And the priority that the environment is given in the hierarchy of water users. I think that's a particular area where people differ in opinion. And actually how that should play out in the future with changing climate. Should we be looking to conserve the environment as it is, or should it be more of an adaptation and allowing the managed adaptation of the environment?

T: Right. And what would be your standpoint on this?

J: I would think that we couldn't completely hold the line position. Because I've been involved in some modelling that's looked at water usage and climate scenarios far into the future for certain catchments. And we ran the model and turned the water abstraction off completely in the model. But still without any water abstraction we were under our current understanding of environmental needs in the far future. So it's just not feasible to not take any water at all out of the environment. The water has to come from somewhere, so that was fairly extreme. And obviously you know that in climate scenarios the variability increases out into the future, but there has to be something in between for me. And I think there is also something on that in terms of which are the priority habitats that need to be protected as well. To make sure that those are prioritised.

T: Ok. So those were the key things we wanted to talk about and it's already taken quite a long time. So I wouldn't want to keep you much longer.

J: Ok.

T: But I'll go over it and also look into the policies and plans that you have mentioned along the way.

J: Ok, well I hope that has been helpful.

T: Yes, it really has. Thank you.

59:50

Bye bye small talk.

Interview with Farming NGO

Project Description

So, broadly speaking we are a charity [personal details] and our aim is to promote healthy soils, healthy plants, healthy people. So, we work with producers, but we also do a lot of work to try and promote people eating healthily. We do a lot of work with schools, we've done work in the past with things like farmers' markets, we have promoted box schemes to try and help local supply chains, and we also work as a link between retailers, supermarkets and some of our big growers to promote organic.

We also have a certification company, which certifies organic farms and businesses. So, financially, around half of our activities are around certifying businesses and half of it is direct charitable activity.

So I work on the charity side, and I work mainly supporting and representing our growers. Some of that would be through funded projects – so for instance we just finished one on soil health for growers. And I am working on a big agroforestry project at the moment looking at planting trees on farms. But then I will also work with policy, so for instance I am one of the chairs for the [gov organisation] and we do some work campaigning and stuff. So a whole range of stuff. A whole range of activities. This is roughly what I do.

I talk to all sorts of different growers and different scales – and certain points in the supply chain.

But my work is mainly with the growers, rather than the retailers, that would be my colleagues.

And you mainly work with horticulture? Or also meat and dairy?

I am mainly focused on horticulture. Inevitably there is some crossover and some of the people that I work with will have livestock or arable crops, but mainly my focus is horticulture.

Would you be able to go over some of the water risks that you perceive amongst the people you work with?

So, yeah, there is a difference geographically, the eastern counties are likely to be affected by a lack of water. Managing extremes is the other big thing that has changed more recently. For instance, we have growers over in xxxx Wales who typically would manage the wet weather, but last year there was a period where it rained 61 days in a row – where you can't do anything, where you can't get out and do anything, sow seeds or harvest anything. And then this year we had the drought, and even growers who had the infrastructure to irrigate were not able to get enough water on their crops.

So interestingly you would imagine that large growers would be all set up and be fine because they have invested in irrigation kit, but I remember speaking to one grower two-thirds of the way through the drought and saying that I didn't envy his water bill – and he said I'd love to be paying big water bills but we aren't getting enough water – we are writing off lots of crops. And right down to local growers where I am in the south west who effectively had all the water they wanted going on 15 acres, refilling from a borehole constantly, but was able to source all the water he needed for his crop – so he had a fantastic year because his infrastructure was right for the scale of the operation and I think that when you get beyond a certain scale it creates challenges because of the volume of water you need.

So you can't possibly get the volume of water you need through the mains, and over the years they have been investing in the digging of reservoirs, but they ran dry half way through the drought basically.

If you compare the risk of drought and the risk of flooding or too much rain – what would you say?

It really depends on where you are. In the west of the country your risk of flooding is much higher. I think it was in 2012 that we had the big flooding, we had growers in [North England] who were on the [North England] lands where the sea backed up onto their land so they were effectively getting flooded with salt water because there was so much rain and that is extreme, but is it something that we will see more often.

In the east of England, it is a lack of water that you would be most concerned about, but we are getting the situation now where you might have a lack of water but all of a sudden you'll have a months worth of water over night on ground that hasn't had any for a while, so you often can't even make use of that water when it arrives.

So it is the extremes that is almost as much of a problem than sort of one-way or another.

Are you also working with microbiological risks?

It isn't something that I deal with very much. I am sure there are some growers who are very concerned about it, but it is not something that I have come across very much.

Do you think that is because of the organic approach?

I don't know, it just mostly doesn't come up. I know one area where it is a concern is herb production where they are very tight on the micro content on the leaves and contamination, but yeah again it may be a problem, but it isn't something anyone has come to me about.

Do you know anything about water risks further up the chain, say in terms of food processing?

No.

What types of water management strategies do you advise people to invest in?

So I guess there are few things. 1) at the most basic level it is to make sure that you have the infrastructure to capture water, so most farms have buildings and not all capturing water from them. So investing in extra storage capacity is becoming more and more important. If we are getting irregular rain, so a lot in one go and not so much at another time, actually being able to grab what you can when it is raining is vital. And certainly the growers that we have seen succeed this year through the drought are the ones that have invested in that.

2) There is also improving the soil health. Which is actually a massive part of this. So having high organic matter levels and good structure in your soil a) helps you hold onto more water in the soil for longer, but also prevents damage to soil when it is extreme, to help prevent flooding and prevent run-off if you have good soil structure and good organic matter levels. And b) part of that is making sure that you have your soil covered when you haven't got any crop in it. Avoiding crops like late harvest maize for example – where often farmers will go in to harvest in October/November often when it is already quite wet, and if they haven't under sown that crop and they are on any kind of a slope then they will lose half their soil out onto the road. So there are ways of managing with earlier harvested varieties, or under sowing it with a clover or something, so then you have got protection over the winter.

So certainly there are things you can do to protect your soils to a certain extent and make more use of the water.

3) and another thing that we are doing quite a lot of work on is with agroforestry – I don't know if you know much about that – but it is about integrating trees into farming systems – and there is massive potential there to reduce flood risk and run off from soil, increased infiltration when it does rain. And potentially, it is interesting actually, over this summer where you would expect with so little water that trees would be competing with crops, but actually what we found when it was really hot was that stuff was growing better under trees. Grass for instance was greener under trees while the rest of the field is brown because they were providing shade so even counter intuitively where you would think they might be detrimental they were providing a benefit. But certainly there is lots of potential to help mitigate risks with trees.

Can you tell me a little more about how that works?

If you get the right tree and the right management system, it can benefit anything really. Because it does things like reduce wind speed, increase temperature between rows of trees, provide shade and shelter for animals, it can prevent soil getting muddy, so you can extend the harvest for crops, there is a whole range of potential benefits. The trick really is getting the right species, the right training system, the right height for the crop, the right spacing. If you are growing salads for instance you would want a different regime than if you were growing squash because salads don't mind a bit of shading and squash like the sun. So you would work on a rotating regime where you have got an alder in year one, and where you cut them down you might grow the squash and by the time you get to year five you might be growing salads in between them because they like it a bit cooler and shadier. It gets potentially complicated – but it is definitely a way to reduce the risk.

I can picture this on a small scale, but how might it work on a commercial scale? Would you have a row of trees and then crops and so on?

Yeah so there are a few farmers starting to experiment with this and I am involved with a project where we are putting in about 200 acres agro-forestry, in a livestock system but effectively you have a row of trees every 27m. But we have a grower in [South of England] who has a row of trees every 27m with wheat and apples in between.

And 27m is that because of tractor size?

Yes exactly. So if you take away a three meter strip for the trees you have 24m for the crops and that is divisible by 12, 8, 4, 6 and 2 so you can put whatever machinery you like.

What is the main obstacle for implementing this type strategy? Is it financial or knowledge based?

I think that there is a financial barrier. If you are talking about storage tanks and irrigation systems there is a cost attached to that. But often that cost is repaid quite quickly. If you put in a new tank 12 months ago you would have made the cost back already. But there is a financial barrier there.

In terms of agroforestry and soil health, there is definitely a knowledge gap with some growers. And actually with the soil health there is potentially a financial barrier because the margins are so tight in horticulture that often growers don't have the space or capacity to put in soil health building measures. So we have been working with growers, these are conventional farmers, who are looking at using more green manure and cover crops into their rotation but there is a cost in preparing the ground, putting the seed in, and it disturbs their current cropping regime, so they might lose a crop every couple of years because of the rotation. And even though most growers are interested in

doing it, it might be the shareholders or the company who might be saying no no keep producing your cash crop.

So the soil health then suffers over time.

Do you then help these people in financial terms?

We don't do financial advice as such. But certainly with some of the projects we have been working on discussing the cost implications of these things, but we are more of a technical help, as opposed to a financial help for individual businesses. But we would give them some advice and they would take that further with their own financial advisors.

Yeah, so there is a [project name] that [research organisation] funded that we were running and certainly within that we looked at financial advantage. There was for example a salad grower who put in a quick green manure crop before the winter before he sowed the salads and he was noticing that infiltration rates improved he had less puddling when it did rain, and found unexpectedly his salads had extended shelf life of a couple of days. Because of that increased soil health. So you do it for a very specific reason but then there is a financial benefit that comes from the back of it.

So what do you think that other actors within the system could do to increase their resilience?

There are a few things. Certainly, financial help, putting in better storage infrastructure would be really useful. And I think that not only helps businesses in terms of resilience and water use, but it also helps communities because you have less water being used on farms and less run off during extreme water events down into the system, flooding downstream, so there is quite a strong case for public money to support storage on farms.

I think, similarly, implementing things like agroforestry systems, obviously there is a cost associated with buying and planting trees, that you don't always see a return on immediately. Timber trees, for example, it might take 100 years before you see a financial return on that. But immediately in years one and two you will see immediate effects on water quality for instance – so I think there is a case for support on that.

The other thing that we have noticed as a part of the project is that there is an increasing tendency towards short term tendencies. So a lot of horticulture is grown on rented land and only for a year as a part of a cycle, so there is no incentive for the farmers to look after soil or to try and improve soil health because someone else will then be benefiting from that in the next years. So one of the things that we have been looking at is to get growers to work together. So that salad grower that I mentioned they have actually started working with the other growers that rented that land to come up with a strategy that would benefit everybody over the years. Which has started to work quite well. But also potentially, if we could change the tenancy structure, where the tenancies were longer with longer term management, you would see improvements there that would reduce risks over time.

What timeframes do growers usually plan for?

So a lot of the big growers will work on a year to year basis – they will obviously have an understanding with land owners and will come back within 8 or 10 years, but in that time anything could have happened, and then they will be driven by the market. So if they decide that potatoes are no longer profitable one year, they might say well aren't going to grow it next year, and so agreements will only be made over one year. For things like carrots where you have to harvest them regularly over the winter if you are supplying supermarkets they want them every week, so you

don't really have any choice as to when you harvest them – and so you could be going in in really bad conditions and potentially end up really damaging the soil. If you don't have any incentive, you only care about getting in and getting the carrots out. But if it was part of the agreement that you have to leave the soil in the same condition as when you found it then or that you have to maintain certain parameters for instance, then you would have to say to the supermarkets that we can't go in at certain times. So it changes the way you approach the management of the land and it is really a big thing to change so it is not something you could do quickly.

Do you feel like things are moving in the right direction?

Not in terms of financial help, I haven't seen anything that is particularly useful. I think farmers are becoming much more aware of it. I think the whole conversation and outlook has changed in the last four or five years and I although we are trying to be optimistic farmers are currently in a difficult position at the moment. Margins are so tight that you have to work on a year to year basis otherwise your business isn't going to survive. Things like long-term risk and things like soil health is seen as a luxury that they can't afford to think about at the moment.

Why do you think perspectives have changed so much?

Well some soils have reached a point where they are very difficult to work with, to grow anything in. So the soil health has gotten so bad that they have realised that they have to do something about it – where they still might have been getting a yield out of it, it is now becoming harder and harder to harvest.

The other part of it is that for growers who are supplying supermarkets there is pressure to reduce the amount of fertilisers and pesticide inputs, and to increase carbon in soils, there is a drive from customers to do something about it.

And just generally around soil health, if you talked about it a few years ago people might have thought you were a bit nutty, but now we've even got a minister of [gov organisation] mentioning soil health so that is quite interesting.

Do you think that there is any potential in the relationship between buyers, wholesalers, retailers and growers working better together? We have heard of course from a number of growers who say that short term contracts make things difficult for them...

Yeah absolutely, but I think that retailers are also in a difficult position as well, but they don't treat their suppliers very well, we would love to see longer contracts and guaranteed prices but I don't see that happening in the short term but it would make a big difference, and give growers the confidence to invest in some of this stuff.

Do you think there is too much competition?

Yeah, some of that, but I think there is still the assumption that if you can't get it here then you can just get it from somewhere else in the world.

Although I did hear one encouraging story where a supermarket tried to reduce the price again to the grower, and threatened to take away the contract if they didn't reduce the price, and the grower said that they would produce it at the lower price, but after a couple of months the retailer came back and said they would take the produce after all.

So I think that supply is getting a little bit harder so things will change a little, but we need to change the power of the supermarkets for sure.

What is your feeling or understanding of the resilience concept? Do you feel that we should aim towards, having a robust or one that is flexible to shocks that may come in?

For me diversity is always the key so diverse systems tend to be more resilient. And that is diversity at all levels really, diversity of crops, diversity of genetics within that crop. So if you are a farmer growing 50 acres of one type of calabrese then you are at quite a lot of risk, but if you are growing four or five different crops with different varieties of each then ok your life is a bit more complicated, but the chances of them all going wrong is much lower. Mixed systems make a big difference. If you can put your land down for fertility building for two years out of five then you are giving your soil a chance to recover by improving the organic matter in the soil, whereas if you have to go in and grow salad year after year you are going to definitely reduce your resilience. Diversity is what we should all be aiming for within the parameters of any particular business.

Even with livestock. So few farms now in the east of England have any livestock on them. And all of that infrastructure has disappeared. You have some quite large farms who are quite interested in bringing back livestock into their rotations, because they saw it as a way of improving the resilience of their farms, but there isn't any infrastructure to help look after the animals and there isn't even an abattoir nearby to slaughter the animals. They have become so specialist in horticulture and arable in that part of the country. In a way the whole system needs to change to support those businesses.

What do think the objectives would be of a resilient farm in the long term?

I would say to produce food in a way that is sustainable, quality and quantity of food indefinitely. Almost no farmers are at that stage. But you would be wanting to reduce your reliance on external inputs because that is always risky. And you know most farms are almost entirely reliant on inputs from outside the farm. Particularly with meat and dairy, if you are looking at the amount of grain and soy that is coming in.

A lot of veg growers are relying on manure and fertilisers, so a self-sufficient farm is what they should be aiming for. And also not aiming for maximum yield. I mean maximum yield is a fairly false concept in my opinion. But looking for optimal yield, a resilient yield instead. So if you look at organic systems for example, you might not get those very high yields, but if you have a bad year, you won't have as bad a yield either. So as a rule they tend to provide a more stable production and income compared to the very industrial conventional farms.

Are there any features of water management that should be maintained? We have talked about what could be changed to improve management, but what should be maintained?

Farmers have put in a lot of hard work in terms of water management, they just need help to do more. I think growers, the horticulture sector, have been quite innovative and not so reliant on subsidies so they have always been a bit quicker to react to stuff. So some of the stuff in terms of using water, drip irrigation, getting water to where you need it and that type of stuff is incredible. And scheduling, so that you are limiting how much water you lose. But there are certainly farmers who aren't at a big enough scale, they can't necessarily afford that type of technology.

So in the long-term what do you think will happen to farmers as the risks exceed what has been planned for?

The more experienced you are, the more you will have seen the more you can plan around stuff. But even this year we haven't been prepared for that length of time without water once it gets beyond

the capacity of the system there isn't a lot you can do, you will just be writing off crops and selling animals. We aren't used to it.

What about in the long term is there alternative business models or alternative crops?

I don't know, I guess that at some point if water is very scary they will have to look at the economics of crops that use less water, but as far as I know there aren't any farmers who have got to that point.

It could certainly happen.

Do you think there are groups of people that have different opinions to you on these topics?

There is probably a difference of opinion between very small and very large growers. But to be honest, when you talk about water the difference is probably smaller than in other areas. Although I could imagine that there are some people that disagree with my position on soil health. And certainly not everyone is up for agro-forestry and planting trees everywhere. But I think that is more of a practical disagreement than a philosophical one. They wouldn't be in disagreement about the benefit of trees, they just wouldn't be able to fit it into their business model as it currently stands.

What do you think about hydroponics?

It's certainly interesting but I don't see it as a huge contributor to fruit and vegetable production. It potentially has a place for herbs and salads in urban areas, but I don't think it has a lot of potential for field crops, and I don't personally feel that it delivers a product that has the nutrient and health benefit that soil grown produce does. I don't think it is a bad thing I just think it is a little bit of a fashion at the moment and I don't think it is the answer to our food supply challenges.

END OF TRANSCRIPT.

Interview Transcript #19 – Government organisation

Interview Date: 01.12.2018

0:00

Introductions, project explanation, etc.

2:45

T: So first of all, are you happy with me recording the call so that I can transcribe the information later?

S: Yeah, that's fine. Just bear in mind that it's my view and I'm not an expert so I'll give you my best policy view and how I understand it.

T: Ok, thanks. So from your perspective what would you say are the key water related risks that the fruit and vegetable system faces?

S: Well, I mean I'm talking particularly from a Welsh perspective. We've got a number of key challenges to growing large scale water or thirsty crops in Wales. And a number of significant water demand is taken off licence supply systems through bore holes. And other extraction. That represents a challenge in that we've, from a policy perspective, believe that we actually have a shortage of water. We've recently moved from, I can't even remember the terminology, but previously there were areas and regions within Wales that didn't have to be licenced for extraction. Now that's gone. Strategically all extraction now needs to be licenced in Wales. We're aware particularly on a number of potato farms in the South West of the need to extract water at different times of the year and to meet the water demands of those crops, particularly through the summer months. The challenge is going to be the licencing will probably not allow for expansion. The system, my understanding is that they'll grant licences on the base of current extraction, particularly the likelihood of expanding that volume to allow for growth is going to be very difficult. So we have a challenge where particularly crops rely on extracted water, for example from bore holes, that the volume of extraction probably won't grow. So they're going to have to innovate to look at better use of water management and crops that are better able to cope without demand for too much more water. So there's a lot of challenges ahead of us. Water extraction I think is a significant challenge and managing water on farms.

T: Which crops are most affected by this? Potatoes you said?

S: Water extraction is a big problem for Wales because it's not only crops but we also have a significant bottled water industry as well and food manufacturing that relies on water extraction for many many different reasons. And obviously we've got for example whole populations that rely on bore holes. So Aborigines at the moment are largely supplied domestically by a bore hole. Which will be licenced, and the expansion of that licence may be very challenging. But if we come back to crops, we've got this pocket in [South Wales] with favourable soils, favourable weather that has really established as a vegetable growing region and we have a protected potato. So the [South Wales] early potato, the PGI, competes with Jersey Royals and it has seen massive expansion in the last two to three years since it's got its EU protection. And it's got more market recognition. And on the back of that potato effectively the whole businesses have grown and got access to big deals with [National Supermarket] and [National Supermarket] and a few of the significant retailers. So [South Wales] potatoes are largely grown through a cooperative which I explained to you is called [Commercial cooperative]. [Commercial cooperative] now produces a number of commercial crops, cauliflowers, broccoli, leaks, potatoes, asparaguses, a number of crops

that come out of that region. So just by the nature of the company, getting more exposure, getting more listings, each year they're planting more and more farmers are converting their land to produce arable crops in rotation with dairy. So it's just the growth of that company and their ability to get more listings in retail that seem probably the demand in water in that area changed. Now, I think the majority of the demand I'm saying is ?? and they have the evidence that it is covered by good seasonal rainfall. But for example this year you'd be aware that we had a really really hot summer and I think that massively impacted. Although I don't have the evidence, I'm aware that the farmers were irrigating certain crops just to stop them from being damaged in the heat and to keep them commercially viable, ready for the market. But I think you're probably best talking directly with [Commercial cooperative] about that because they will be able to give you more facts around potentially how they use water. The jewellery in xxx Wales though is that the soil retains a lot of moisture. So I think seasonally there's only a very short period of time where they become water deficit. Does that make sense?

T: Yes. And so do you feel like there's still large potential in increasing water efficiency and deploying irrigation technologies to allow for growth?

S: I'm confident that the cooperatives will be looking at that, because they want to keep growing so they're going to be looking at those challenges. Whether that means that they consider crops that grow through the winter and finish in the spring. You know the xxx Wales earlies are only available for a short period in the summer, they're very, very seasonal, and that's how they marketed them. I don't know whether they would push very hard for a huge growth in volume because they get a premium on a product. What they want to do is restrict the availability, so it becomes a core seasonal product and to get the most out of it when it's available, certainly. There's lots of effort around waste management as well. For example they had a massive growth of cauliflowers recently due to weather circumstances and these would have normally been towed back in and they were able to renegotiate with the supermarkets to take extra. So they avoided lots of waste. That has a consequence then on what they'll do next year in terms of planting, their confidence, that will obviously then impact the water requirements. I think I'm not technical enough to be able to give you all the details you need, it's only a feeling but I know with the licencing water is going to be an increasing problem for those growers and thinking how they can use rotation, different crops, take the advantages of the seasons to push crops that require water, these are all things that I'm certain they will be considering.

10:52

T: And how about water excess in terms of heavy rains and floods, how does that affect the area?

S: Sorry, could you say that again?

T: How about water excess in terms of too heavy rains or floods?

S: Yeah, I think for example if you take the most of places where xxx Wales early potatoes are grown, they grow naturally on the coast where loy meath soils area, and they can be subject to runoff and the challenge with xxxx Wales earlies is the soil needs to be light and lonely, so you can't overseed it. So you can't put another crop in to hold the soil down. There's a period in the year, only a short period where the soil is bare. So that has advantages to the textures of the skin of the potato and that's why they do it, but it has a disadvantage in that the soil is unprotected, and potential erosion can happen. They're managing that, they're looking at that as a problem and we're working from a government point of view in terms of land management on how they can mitigate that, so reducing the

time when the soil is bare. But except for xxx Wales earlies, they generally tend to ensure that the soil is constantly cropped so that it has a structure within it, a plant to hold it still to avoid erosion. But we've seen a lot of water land in Wales and we're increasingly seeing very dry summers and wetter winters. And so soil erosion and water runoff is going to be a problem for managing soil structure in the future. So it's about looking at how you can ensure that you protect your soil from that damage. These are things that farmers are putting in. [Commercial Cooperative] for example is a really good one because the cooperative provides agronomy advice, so if you're part of the cooperative of [Commercial Cooperative], they pay a full-time agronomist and environmentalist to look at conservation and cropping. All of these things and it's, within Wales there's lots of restriction on production in that area which probably means that the farmers are very acutely aware in terms of how they manage the soil in relation to water and then also manage the crop in relation to water.

13:20

T: Ok. And from a government perspective, would you say you're more worried about water scarcity or water excess?

S: Well, I think as extremes they have a significant impact on both of them. So we've seen droughts, significant droughts, this summer. Which, you know, would kill a crop or require the expensive extraction and use of water. At the other end, you know we're finding that farmers are feeling bad because they physically can't do anything with the land until late in spring because it's too wet to get machinery on and the damage that happens early in the crop life cycle because of run off. So they're equally as damaging.

T: Ok. Do you feel like the experience of this summer will change anything long term in terms of the government's water approach?

S: I don't think it will immediately. I think the attitude I've sort of had was that it was a one off, it was extraordinary, and it will be back to normal. But I think people are conscious that things are changing. Whether they all react until it becomes a pattern, I'm not so certain. But farmers are very adaptable. And what's different about xxx Wales largely is that it's a sophisticated farming area. It's a big dairy area as well. So farmers generally have equipment, they have infrastructure, or they can access that through collaborative opportunities, coops and such. So when they challenge strikes, they can respond quickly rather than being in isolation and not being able to find equipment or assistance. That area is very set up to respond to farming needs. It's a very well-established region of agriculture. Does that make sense?

T: Yes. What kind of support do you offer to farmers from the government?

S: In terms of water or generally?

T: In terms of water management.

[connection cut out]

16:50

T: Hello, it's [name] again.

S: Hi back. I don't know what happened, I could hear you talking but you couldn't hear me anymore.

T: Yeah, I don't know either. But we're back now.

S: So yeah, we were talking about farming connect. So we have an [name] funded scheme which supports farmers to include all sorts of different elements of those businesses. To

farming connect, there are, and we have other environment schemes as well that look at water management. But farming connect is about helping farmers to develop their skills, build their businesses so that support is available for that mechanism for many many different interventions in terms of training and getting consultancy support. Can you still hear me alright?

T: Yeah.

S: Good. And then wider than that, you know, I work within the food team so we can help and support in terms of when the product becomes a food product. Water management plans then are part of the agri-environment schemes that we run. Obviously being included in an environment scheme is voluntary. So a number of our farms in xxx Wales would do it and naturally volunteer to be part of those agri-environment schemes and water management plans are a big part of that. But wider than that, commercially, as I explained earlier, Puffin, the cooperative in xxx Wales which is our biggest example. They have full time consultants working within their network. Which helps farms with things like nutrient management, water management, cropping. Things like that.

T: Ok. And what would be your understanding of resilience? Or your long-term objective?

S: As in, in relation to fruit and vegetables, what do I consider a resilient system? IT's one thing we're looking at at the moment is the ability to reduce, so in Wales we have a legal imperative to protect Wales for the future generations. So the future generations act as a legal imperative to ensure we don't do any damage now which would impact future generations. So through that mechanism, all of our support at a detailed level is about ensuring that what we do now protects things for the future. So in terms of agriculture, it's about ensuring the system can maintain the flow of food that we require but also will not impact on our environment or the future generation. I.e. we don't do things now which will detrimentally impact the future. So farming, the word sustainability moved on from that bit, it's about ensuring that farmers can make a living and that they do so conscientiously that it doesn't negatively impact the environment and the land that they affect. It's about being neutral, I suppose. If we take something out, we need to put something back, ensuring that we return it, and we think like this cyclically if that makes sense.

T: Yes, that makes sense. Other than farming, so on different levels of the supply chain, how do you feel water is managed in terms of food washing and food processing, manufacturing?

S: So the same thing applies, we have our future generations act which is our imperative to ensure that we don't damage Wales for the future generations. So I work on the food team and the same rules have started to impact food production. So water and the demand for water we are seeing our business grow in productivity. Not necessarily have more businesses but businesses are better operators. And they recognise water and water management will help not only meet their needs corporately to be good organisations, be responsible organisations, but also commercially. When you get past a certain level of water use obviously it gets expensive. And we're learning now that there will be challenges with extraction licences. The businesses will have to be a lot more intelligent about how they use, recycle and obtain water. So one really good example is we've had a recent development in [city name] . A quite substantial manufacturing firm. And was part of the scheme's design they put in rainwater capture systems and filtration systems and they're trying where they can to recycle the clean water to keep as much within the manufacturing process and not waste it. So whatever comes out they recycle it back in where it's feasible to do so. But obviously that's a massive challenge with health and safety. IT's got to be done appropriately and it's got to be safe. So we have lots of different pockets within the Welsh government to support innovation. And for example as well we look at renewables and how we can help

generate slicker(?) economies. We're developing a brand value scheme, which will say that if you do XYZ and are environmentally friendly and conscientious so if you're a responsible organisation you can be part of our club effectively. And we get you kudos and recognition for that. So there's lots and lots of things going on with food manufacturing which is obviously very closely related with primary production.

T: But do you feel like you actually, there is a need for the government to incentivise a lot or have companies recognised it?

S: Yeah, I think we're not in a time that's about sticking carrots. The industry will respond and is responding to consumer demand. And the consumer now is much more savvy and is starting to expect a great deal more behind the food they consume. So they expect companies to be responsible socially and environmentally and I think that's become much more the norm and companies are responding, commercially responding. But also its good business, you save money, look at productivity and how you can reduce the cost and be more efficient at the same time creating a much more quality, ethical, consumer friendly product. So part of it is creating an environment where we're telling businesses this is what we want. For example our grant scheme, we have a number of capital investment schemes for food manufacturers. There's a requirement now to get approved for the DEI process, the indication stages might progress into those stages. You have to prove that you are conscientious and you're thinking about those things within your business. We want to only operate with businesses now that are forward thinking environmentally and socially responsible and tie into the future generations act or resilience plans, etc. etc our strategies. So from momentarily sending out those messages to businesses who want to access our funding, businesses are reacting by developing those systems in their businesses to ensure that they can access our good stuff. We're also chapeling and producing case studies and media around conscientious good business practice that meets these aims. I'm also starting to think that commercially businesses are just more switched on, more tuned to the fact that the consumers are expecting this. Some of our biggest businesses now are developing strong CSR policies, they're trying to reduce their environmental impact because they know that's the right thing to do. So there's a little bit of both. We as a government want to push our businesses in that direction but we also have the consumers pulling businesses in that direction as well.

T: And how would you say is your approach in comparison to other countries in the UK?

25:44

S: I think we're all doing things very slightly differently. Obviously, we're the only devolved country in the UK that has a legal imperative that ensures whatever we do now does not impact the future generation. I think we have devolved responsibility for agriculture. So we're looking very differently at agriculture. Our systems are different. If you look at agriculture, we have a lot more affluent in Wales, we have a lot more less favoured areas if that's the term, we have a lot more partial areas, we have a lot more livestock production which in essence, you know, makes our system different to potentially England that's very arable based. Very focused on crop production. So policies need to be different to reflect those nuances domestically. So we're very conscious about, we want to push agriculture not only to be commercially viable but also have the lowest impact in terms of environment. So that's something that whenever we're looking at our new agriculture strategies, we've just been negotiating a new agriculture bill and all of the things that go around that and Brexit will change everything. So there's a lot of boobs ahead of us where we will be able to really champion where we want to be in Wales that may be different to the rest of the world (??).

T: Ok. Are there any stakeholders that would have a different view to this and who are more challenging to get involved?

S: In Wales we are constantly challenged by our farming unions, that's their role. They act as our scrutiny and make sure that we're doing the right thing and not negatively impacting the industry. But I think generally we're in a good place and there's always people who aren't happy about the details, but I think generally speaking our stakeholders broadly support what we do. We spend time listening to them and try to engage and feed back into policy development from the industry. We are very close to our industry, we have a number of, there's the food and drink board which is entirely made up of commercial food businesses that effectively work very closely with the government. We have an agricultural advisory board that is made up of agriculture representatives and farmers and they work very closely with us. Our minister is very closely engaged with the industry. So I think we have an advantage, it becomes a good and a bad thing that we're very close to our industry whereas I don't necessarily see that particularly in England. But I think they have different mechanisms and different views, so we don't mirror what they do. And I wouldn't, I don't know whether I really think our industry is unhappy with this, but we're certainly in the middle of a massive change where we feel as though we're going together in the moment. That might be very different in a year or two's time when we start to change, and we start to see things on the ground that are impacting farmers and food producers. They might feel very different then but at the moment we feel as though we're engaged and we're talking to each other.

T: And are those mainly one on one conversations with the different unions and companies or how does that work?

S: Yeah, lots of different matches. So industry can very easily access our ministers, that's the joy of a small country. So our xxx, on Monday, was at the Winter fair and spent a day in meetings sort of talking with unions and farmers individually and farming and crop groups and young farmers and she would have spoken to food manufacturers at the event. You know, she will talk directly to people on the ground. And then her constituency work she'll talk to people directly in her constituency and then we have the food board that she liaises with a number of people per year through activities and events. I think we're very close to our sector.

30:15

T: Ok. And on a system perspective like this, what levels do you think, what features do you think should be changed still to increase resilience to water related risks?

S: It's not my area of expertise. So I think we've got a lot of work still ahead of us. I think we're still in that grace period where water is abundant, and we haven't really started to see massive issues of it although we've had a very dry summer and we'll probably have a very wet winter. We've managed. But I think attitudes are changing and it will certainly become a much hotter topic and then hence a greater priority. Although we have a number of environmental initiatives looking at water management. Obviously, we have a water directive and forming competency around water in Wales. It's something that we'll always be at the forefront. At the moment though I think our water strategy, our water management plans that happen from farm level up to our strategy in the water division in government is certainly adequate. But we will be constantly reviewing that because I think there's a lot of change happening.

T: Are you aware of any key features of the current water management strategy that you think should be maintained because you think they're really good?

S: I'm not familiar with it. I don't know enough details. I might have to direct you to some of my colleagues in the water directive to get better views from their point of view. And they're very much from a different standpoint to me. I think they would talk very much about their concerns about water much more passionately than I would.

T: You know, I think that's also an important perspective to get. It's also important not to make problems appear worse than they actually are and maybe acknowledge that maybe water is not one of the main concerns currently and that we should be looking at other things.

S: Yes. And what we'll do is I give you contacts of different people within the government. So I think where I reside, I see it from a business perspective and from a consumer perspective and I don't know whether we're entirely aware all the time of the nature of the supply. So actually having a perspective from someone who's very close to supply and hence the key problems that maybe we're not really aware of at the other end, that would be a good addition to this conversation.

T: Yes. Are you aware of food imports to Wales and how resilient the supply of that is in terms of water in growing regions?

S: Well it's something that's come up recently from a different guy, so we recently had internally a number of discussions about palm oil and through palm oil I think our ministers started to really think about the nature of the food system. And we're doing some research at the moment looking at supply back to origin and understanding the impact of what products they're producing from other origins. Because we still blindly consume stuff and it's got to be better at conscientiously thinking about the impact of the product in the place that it's produced before we consume it in our country. So I think that's starting, there's more awareness. Whether we're actually doing anything about it just yet, but I think that's going to be coming. And one of the really hard discussions we've had about palm oil is that there's a feeling that palm oil is devastating to rainforests and we accept that. However, we've also considered where else would we get oil from for the food industry? And would there be a greater more significant impact from shifting from palm oil to another oil? And suitability of where that would be grown? So it's not a simple question and it's so complex. But I think we're starting to consider that more as we're being asked to look at policy development. We recently had discussions about whether we as a government start to discourage use of palm oil and I think it was too complex to have a clear steer because what would be the consequences of that? Where the industry needs oil as an input, where would that subsequent oil come from and would it have a greater impact elsewhere? So there's so many more questions we need to have answers to. I don't think it's very straight forward. But your question was, are we aware? I think we're getting more aware. But I don't know what the answer to that is whether we're actually in a place to do anything about it just yet?

T: Do you know how much food is imported versus grown in Wales or in the UK?

S: One of the things that we're looking at through a Brexit lens is the opportunity of import substitution. So where a product could be domestically produced, a) understanding why it's not currently produced domestically and b) understanding could we develop and support supply chains to knock out those imported products and what would be the implications and the benefits of doing that, the cross-benefit and the hassle around that. So it's something that we're very acutely aware of that Brexit gives us an opportunity to really seriously look at all of the products that are imported. If you look at fruit and veg, you'd be well aware that a significant volume of fruit and veg is imported into the UK. And its understanding why is that imported, and could it be produced domestically and what would take us from importing to

starting to supply that domestically? So that's quite an interesting piece of work for us at the moment.

T: Ok. So those were the main questions that we had. Is there anything else on your mind that you think should be included in the discussion?

S: No, I mean all I'm interested in is the outcome and I'd like to see the manuscripts as well if that's alright with you. And I think there's a lot of interest in this internally in this. I sit within the food manufacturing, the food space. We have agriculture colleagues and we have environmental colleagues and we have water colleagues and what would be really useful is to have a way of bringing them all together. Because we're getting better at it, but we admit there can be weakness around this thinking strategically. So we think about water in our food space and agriculture think about water in their agriculture space and we have a water directive that looks at water at a high level but maybe doesn't think about the different parts of the consumers. So there's a cross cutting piece of work that we touch on that probably needs to be strengthened and we've got lots of opportunity to build those cross-cutting links and we will be developing these strategies in particular over the next couple of years. So as we decouple from Europe in 2020-2023, we are going to start to see significant changes and thinking differently and considering these things better will be our responsibility. So it's good timing.

T: Yeah. Ok, I'll definitely keep you on our list of people who like to receive further information about the project.

S: Great. If you can email me as well just to remind me of your contact details and what I'll do is to respond and put you in touch with other contacts if you want to pursue those. I'll give you one for our water team that looks at the legislation of the physical water and the consumption. And then I'll contact [Corporate cooperative] and see if they would talk to you as well.

T: Yes that would be really great. And maybe if that's not too much to ask it would also be really good to talk to a manufacturer that might use fruit and vegetables.

S: Yes, yes. There we've got, I've got a colleague in a big abattoir and they've looked at water recycling on site because they were having not so much problems, but they were conscientious of affluent charges on site. So they've looked at different ways of managing water around the site but also then for the physical production, how they use water in the facility. So that may be a very interesting one for you to talk to and it would give you a taste for innovation as well.

T: Yes, that would be really great.

S: So if you can prompt me, I'll see if I can find the contacts for you.

T: Will do.

S: Alright.

T: Thanks very much for your time and support.

S: No problem, nice to speak to you. Bye bye

T: Bye!

Interview Transcript #20 – local wholesaler

December 2018

0:00

Introductions, project explanation, etc.

1:40

I: So the first question would be if you're ok with me recording the call so that I can transcribe the information later?

P: Yeah, that's fine.

I: Ok, thanks. Then to start with, would you be able to give a bit of a summary of what kinds of fruit and vegetables you mainly work with?

P: All kinds of fruit and vegetables, yeah. All of them.

I: So where do you source them from?

P: We'd source them from local markets, from local growers, from, you know, local suppliers in [city 1], [city 2], all over the place. But mainly the UK.

I: Ok. And which other business do you mainly interact with? So, who would you sell to or cooperate with?

P: We serve caterers, so could be restaurants, could be pubs, contract caterers, hotels, yeah.

I: And all of that in the [county] area?

P: Yeah, the furthest we go is probably 60, 70 miles away from the warehouse.

I: So, who would you say you're mostly dependent on in the supply chain? On farmers or intermediary suppliers?

P: Intermediaries. We do buy, you know, a small percentage direct from growers, but most of it comes from wholesalers and suppliers.

I: Alright. And then what are the water risks that you have been experiencing in your supply chain that have affected you?

P: Well as we discussed yesterday, I don't really have any influence on that. I don't, we know that there's been, it's been a difficult year and the potatoes are struggling and there's various products throughout any season where water is an issue, but, yeah. I don't have any direct knowledge of that.

I: Ok. And from your experience, would you say water scarcity is more of an issue than heavy rains and floods for the produce that you buy?

P: Would I say that? I don't know the honest answer. I probably wouldn't say that. I'd probably say that at certain times of the year there are, you know, heavy rain and snow can be as damaging as lack of rain.

I: And you wouldn't have observed one of them occur more frequently?

P: No.

I: Ok. And have you ever had any impacts on your sourcing in terms of not being able to get anything because of a water event?

P: I suppose, though I can't think of the specifics. But there are times when certainly when the market goes tight. At the moment baking potatoes are tight because of the dry summer. And you know, yields are down on potatoes as we discussed yesterday. So, I would say that's the one that is the most predominant one this year, it's the potatoes. That happened probably 2011, 2012, that year was a bad year for potatoes. For similar reasons but also there was disease that year as well.

I: And then can you just repeat a little bit your strategy that you mentioned yesterday about what you would do about it? Would you try to go for different potato varieties or different growing regions?

P: You know, with the potato you can still, you know coincidentally I have had a phone call from a customer this morning who has said your potatoes are amazing. And my potatoes aren't amazing but they're good quality. And the fact is that I do pay a little bit more on potatoes, but they are, on the quality part I'm not the one to get cheap and cheerful. So they said where they were buying from and I won't mention the other competition, but where they were buying from, the potatoes were poor quality, they were small, they were no good, it was bad quality. They moved to us, and you know they say the potatoes are so much better. So, there's always, I suppose it's like any commodity market, it's supply and demand. There's always good quality gear available but sometimes it's more money. If you've got an abundance it's cheaper, if you haven't, it's more expensive. I suppose it's simple supply and demand mechanisms. And you have to, in produce, you have to, in my opinion, you have to draw a line as to what you want to be. Do you want to be a cheap supplier that sort of, and if you do that you're forcing yourself commercially down the route of buying as cheap as you can, or if you want to be a good quality supplier, then you accept that you've got to spend more money and then in turn your customers have to understand that. And if they want good quality then they may have to spend more money, but paying cheap twice is what I think.

7:43

I: Ok, so you're going more for the high-quality stuff.

P: Yes. It has to be the right quality. I wouldn't say high quality all the time, but the right quality. It's not like it's the best potato in the country, but it's the right quality for the job, for the chef.

I: And for the right price.

P: Yeah.

I: But you would never go ahead and look for a cheaper potato from abroad or something like that?

P: Well I suppose I would look for it, I would always look to see if there's a cheap potato at the right quality. And I suppose it's not just potatoes, any product like that. In fruit and vegetables, you don't just buy strawberries, for example. You get different grades of strawberry, and you know some of those grades would be ok for some customers and some wouldn't. You know, if people are using them in patisseries and for top tables for, you know, establishments, well then they need to be good quality. If people are making strawberry purees, they don't always need to be the most beautifully plumed strawberries. You know, it's getting the right product for the job that the customer requires to do with it.

I: Yeah. Do you know anything about the growing practices of the farmers that you source from in terms of what sustainability mechanisms they are using?

P: I don't think so. Off the top of my head I couldn't. You know, I've visited many, many farms over the years in the fruit and veg. But I'm not intimately knowledgeable about what they're doing. I've seen what they do, and I've seen in hydroponics, you know, normal, arable farming and I couldn't say that I've got a deep understanding of the growing practices, no.

I: And so how would you judge the quality of a product?

P: You know, one of the things, I'm a relatively small business and relatively new, but I've been in the industry for over two decades and I know the game. And there are various ways

to do it. From doing tests on bricks levels and things like that which we don't really do, but the best way to try if a product is any good? Use it, look at it, eat it, you know. We could take a box of easy peelers or subsumers and they might look fantastic, but you open them and you eat them and they're sour. So ,they're not good. They look beautiful but actually, if that goes to one of my customers and they peel it and put it in their mouth and they're squeezing their face together, then we've failed. So, we taste, we feel, we, you know, we juice, that's the way that we do it.

I: So, you would actually go to a wholesale market and try different products?

P: No, most of the products we get delivered in. It gets delivered and we test it on the back door. You know, we got some new potatoes yesterday that were no good and we rejected them, sent them back, they were no good. Everything that comes in we do a sample check on. We have a look at it and some things might just be a visual check and be like yeah, that coloration of tomato is good, and we know we had them yesterday and it was all good. But it might be that, you know, avocado we only serve ripe avocado. So, if they send us quickables we reject them.

I: And how far do you plan ahead in your business?

P: With regard to produce? Stocks?

I: Yeah, so in terms of your sourcing, would you mainly buy just in time?

P: We're very, very much, there's a few products that we have where we forward price, but most products are very short, you know. I don't contract many prices, because I find that actually contracted prices forces the grower into a corner. So, it sort of goes against the grain of what I told you about quality. In my experience, and I've been working in bigger businesses where we have contracted. So, if we had a contract on some peppers, and last year the price was 5 pounds and we priced it at 4.50, ignore the money. This is not right. If we contracted 4.50 and the growing conditions of peppers is not as good as it was last year and the guys in Spain were unable to predict that, well then if we hold them at 4.50 a box, then they are losing money and supply and demand adjusts that they won't be sending us the best quality product. You know what I mean?

I: Yeah, I get that. And in general in your business, do you have a three, five-year business plan or something like that? Or what's the timeframe you're working with?

P: I suppose I've got a rolling one. It's not set.

I: Ok. Do you have any thoughts about what could be done to increase the resilience to water risks in the UK for fruit and vegetables more generally?

P: That's a big question. I don't to be honest, no. I wouldn't, anything that I said I'd be making up.

I: Ok. If say the water related risks would go beyond what people have planned for and you say there's not going to be any strawberries one year, then you would just pass that on to your customers? And tell them that you can't supply?

P: I think, I don't think that's a reality for us. I think as I've mentioned there's always a product available, it's just what you pay for it. And then whether the customer is willing to. Ultimately, I've never been in a position where I can't get strawberries, but I have paid a ridiculous amount of money for strawberries and it's down to the customers if they want to buy them. That's the situation. I don't think it's, I think to suggest that there will be no strawberries one year is a massive exaggeration.

I: Ok. Alright, I think that's already all we needed to know.

P: Cool, ok, hopefully it was helpful.

I: Yes, thanks so much for taking the time.

P: No problem at all, have a great weekend.

I: Thanks, you too. Bye bye!

P: Bye!

Interview Transcript #21 – large retailer

December 2018

0:00

Introductions, project explanation, etc.

0:41

I: Are you happy with me recording the call so that I can transcribe information later?

P: Yes, absolutely fine.

I: Perfect. So, to start with, could you explain a little bit about how you go about sourcing your fruit and vegetables?

P: Yeah. Did you see the email I sent to you over the weekend?

I: Yes, I saw that. Sorry I didn't get a chance to reply yet to that.

P: Ok, I'm just trying to hit your questions up. So what's the first question? How do we do our sourcing?

I: Yes.

P: So, we source through a number of packers and growers around the world.

I: And what kind of percentage of your fruit and vegetables would come from the UK versus internationally?

P: Well, depends on the time of the year. I think this figure is difficult to produce. If you ask for the whole of fruit and veg, then I think this figure is quite low, about 50%, but if you take what's in season, we would be up in the 90ies because our policy is to source from the UK.

I: Ok, so as far as possible. And do you have your own packing companies that *[retailer]* owns or do you work with other suppliers?

P: Both. I'm not quite sure what that question has got to do with water though. That's a commercial question and I don't want to answer any of those.

I: We're just also trying to understand how the different stakeholders are connected with each other.

P: Ok. Have you worked in the fruit and vegetable industry at all?

I: No, I don't.

P: Do you have any experience of it in any capacity?

I: I haven't.

P: Ok. Next question.

I: From the people that you work with, would you say that you're most dependent on your suppliers or on the farmers?

P: Both.

I: Ok. So, what would be the main water-risks that you think your supply chain is exposed to?

P: We would consider the main water risk to be obviously climate change.

I: Ok. How would that play out? Do you feel like there's more risk in terms of water scarcity or water excess or just variability?

P: Water scarcity and at times water excess.

I: And can you differentiate the risks that you perceive in terms of different growing areas or product ranges?

P: Yeah. What I'm going to say is it depends on the partnerships and where. There's grower charts on the web that show the areas of water scarcity now and the areas of water scarcity in the future. So, for a retailer, it's slightly third party, because we are not the ones directly affected by a water challenging issue. It's the growers in the field who are. So, if the risk is

with one grower in one part of the world, the retailer can move its resources to another part of the world. So, it's the grower who takes the damage head on. What tends to happen for a retailer is that they will notice more distraction in the supply chain. They may see an increase in prices. But the retailer is not directly affected, usually. Taking an area like Spain last year, we had very heavy rains in the November, December period. So, the effect that we saw was poor quality in citrus. Though we were able to manage that by trading it on to other areas, for the grower involved it was a quite devastating loss of money.

I: So, your strategy would be to diversify your supply range as much as possible?

P: As much as possible. But you just can't switch on leading growers around the world like this. The relationships have to be made over many, many years. So, we're always going to try to go to trusted sources wherever they are in the world.

I: So, do you also work with more long-term contracts with growers then or how do you go about that?

P: Many of our growers we've been trading with for 50 years or more. So, we want to have long-term relationships. But it may be that in some parts of the world, for water and for other risks as well, they've become unsustainable in terms of being able to supply fruit and vegetables to a retailer.

I: And then do you try to help growers in any way to increase their resilience to water risks?

P: We have a *[retailer]* agronomy group. And the agronomy group's function is to articulate to various types of people the agronomic challenges of which water is one that happens around the world. So, for example, we will be holding annual science days, we will be undertaking research, all to do with water management. And we will put some of that through the supply chain and back to the growers. Which sounds like a great thing to do, doesn't it? But the challenge always is how they implement the knowledge at grower level. Often what we're saying is quite striking in that we're forecasting heavier rainfalls, longer periods of droughts, different mechanics to irrigate crops to actually save water. We have our advisor, *[professor name]* who is one of the leading water experts in the world I would say when it comes to managing crop performance by deficit irrigation. So, we can bring all this knowledge to the party, but at the end of the day, what happens to a grower in Chile is often related to circumstances in Chile, are you with me? But there may be other issues. For example, Chile's never had a real water problem. But now with the lack of snowfall in the Andes and increased food production, water is becoming an issue in Chile. And also you have to look at our markets as well. It's not as attractive to Chile as perhaps North America is. So different reasons require different types of actions. It's not always water, but water is a serious part of them. Does that make sense at all?

I: Yes, that makes sense. And comparing the scale of your agronomy advice to the scale of sourcing and produce buying that you do, how much of an impact do you feel like you have with that?

P: It's very hard to say. I think that any supplier from *[retailer]* understands the issues of water. We run a *[details anonymised]* training course with *[university]*. We train our own pharmacologists in the programme. So, we know what's going on on the ground in terms of water. And I'm going to have to say that water is not my number one priority. Soil health is my number one priority. And soil health means storing more water in the soil. Which is where it should be anyway. And so we've done a lot of work on water over the last 15 years. It's still a big challenge, don't get me wrong. But soil health is my bigger challenge at the moment.

I: How do you perceive the conversations that are happening around water risks and water management in the UK versus internationally?

P: Well, what do you mean by that?

I: In terms of, do you feel like growers in the UK are becoming more aware of the need to think about irrigation and water management as well?

P: Yes, definitely. But again, it requires investments. Maybe in irrigation equipment and you have to be a certain size of grower to afford that investment. Trickle irrigation is not cheap. And the other thing is that there's a tension between the water companies and the public in terms of how growers are perceived for using water. So, one way around that is we are always encouraging more on-farm reservoirs which would both be accessed by the farmers and the water companies. I think farmers have a big role to play in catching water that falls in excess. So, the traditional fill of a reservoir was during the winter. And we don't see that as the future. There will be heavier downpours of which there will need to be quicker management to get that water into a reservoir rather than it running through a town or city.

I: And apart from climate change, what would be other risks that you identify?

P: In terms of water?

I: Yes.

P: Well the biggest one is obviously, because of soil health and soil management, is obviously diffused pollution where you get water runoff into the roads and streams and things. Is that what you were thinking?

I: I'm not really proposing anything, I'm interested in knowing what you are thinking, but yes that is a direction that ties into my question.

P: It can go in two ways, you can talk about too much water or you can talk about not enough water. It's how you manage those risks which is what we're trying to do. And the message I'm trying to get across is, because the issues are more extreme, our response has to be more dramatic.

I: Ok. And do you have any knowledge about water risks further up the supply chain, so in washing and food manufacturing and processing?

P: Oh yeah, we have. We understand all of that. Most of our growers of protected crops will be recycling water. So that's really good. When you go to the pack house situation, it's a bit more difficult there. Because their cleaning and processing needs to be done after the washing. So that's a bit more tricky. But people are looking all the time at how they can be more efficient with water usage.

I: So, you're also experiencing a lot of development there in terms of water efficiency?

P: Yes.

I: And what would be the main water risks at that stage? Does anyone have problems with not having access to enough water for their factories or is it more microbiological?

P: No, I think that once you're in a factory setting, you're normally in an area where you can access water quite easily. So, I'm not too concerned about that.

I: Ok. Would water be a big cost factor for factories? What would be their incentive to increase efficiency?

P: That comes back to the size of the factory and being able to maximise the efficiency of the water you use. So, yeah.

I: And so, do you to some extent work with factories and food manufacturing in terms of water-risks?

P: Yes, we do all that, yeah.

I: So what do you do there?

P: We are working with our suppliers to reduce the amount of water they use.

I: I see. As a business, have you had any severe impacts in terms of water events in the past or have you always been able to manage it somehow?

P: I don't understand the question.

I: So, have you at some point not been able to supply a specific product because of a severe water event or are your supply chains resilient enough in a way that you can always source from somewhere else?

P: There's two answers. I think I'll go back to what I said earlier. Yes, there have been shortages to do with water issues around the world, but there's also cover that a supermarket can get. So, the gross impacts are actually on the growers and suppliers. There's normally a way around for a supermarket, normally. Are you still there?

I: Still here.

P: You're going to hear a slight change. I'll go to my car now, you may not notice it but you're going on loud speaker in the car.

I: Thanks for the heads-up. So, what was the second part you mentioned? You cut out a little bit there?

P: We are seeing increased distraction in our supplies because of water events around the world, but we can normally cover those with other sources.

I: And what are the time frames that you use to plan for water-risks and water management?

P: Say that again, it just cut out the volume when I connected to the speaker.

I: What are the time frames that you plan for?

P: How do you mean, time frames?

I: So how long in advance would you plan your sourcing but also your agronomy advice and investments that you might make?

P: Well I'm going to a meeting today, or tomorrow, where we're looking at 7 years out. But I think you've got to keep thinking that, it's what I already said, water is one of many key events that can distract supply. Have you heard of Professor John Beddington and the Perfect Storm?

I: I haven't.

P: Ok. I advise you to look at that, because that will give you all the issues I'm content with today.

I: Ok. And it's not like the project thinks that water is the only issue out there, it's just that our sub-workstream focuses on water and there's other people who focus on other things, so that's why maybe these questions appear a bit unbalanced. But we just try to look at water specifically because it does have a growing influence.

P: Yeah, I mean, what does your project actually want to show? Are you trying to help UK water?

I: So, the objective is to explore how resilient the UK's supply of fresh fruit and vegetables is to water risks now and in the future. And maybe we find that the system is already really resilient, or we find that there's a lot that needs to be done and thought about and these are the steps that should be taken. And also trying to understand the different perspectives of a grower, retailer, food manufacturer and the different water risks that occur on different stages of the supply chain as well and how these are connected.

P: I think my message to you is that if you look back at the last 20 years I would say that our water has proved to be very resilient in terms of supply. But if you look at the next 20 years, in terms of what climate change can throw up and you look at the events of this summer 2018, then it's not resilient at all. You know, a few weeks without rain and we look at a shortage of reservoirs. What I'm trying to say to you is that we can mitigate those risks by looking at soil health, the amount of water stored in the soil. Looking at the way we plan our reservoirs around the world and around the UK. And that means that the government and

water companies will need to come together with the farmers. And we're trying to broker those kinds of things.

I: And so the ways you influence that is by your agronomy advice you do directly with farmers and then I guess you talked about education that you do in the training course, what would be other ways of influencing it?

P: I wouldn't call it education, I would call it, we're trying to show that as *[retailers]* we're fully engaged in the water challenges and that we have access to some real expert advice. We deal with suppliers. Suppliers are the people we pay the money to. Growers are the people who supply the suppliers. So, we are in effect in a third-party position. Not always, but often. And so affecting change, unless we're taking the whole of produce from the farm which we're not, is actually quite slow and difficult. But it is happening. I could take you to some great sites around the UK that have invested in their water management systems and have become more sustainable. But they're probably asking themselves today, have we invested enough?

I: Right. And the ways in which you try to affect change is through advice and raising awareness, or what would you say would be the main strategies that you use?

P: We have an assessment program. The *[retailer]* farmers assessment that goes around and pulls up blocks of data on water, and we're able to share best practices and drive consumers and improvement through that.

I: And then you just hope that suppliers and growers realise that that is an area that they need to invest in for the future of their business?

P: Yeah. It's only one part of the story, if you look at the perfect storm scenario of Professor John Beddington, you'll see that water, whilst very, very key is not the only part.

I: Ok. And what would be your definition of a resilience and a resilient supply of fresh fruit and vegetables? What would the best outcome be?

22:48

P: You know, I think we have to, there's a number of ways. For water to be stored and managed, in a sustainable way, I am being vague on that because it's very hard to predict exactly what the world is going to throw at us in terms of rainfall over the next 20 years. 8 years ago, we were looking at Kenya being short of water, and now we're looking at it being greatly flooded. So, it's the change which is the most scary part of what we're trying to deal with. And I think the view that all of us hold is, that the more this change becomes extenuated, the more difficult it is for your people to actually plan or say anything. And that's why people are meeting around the world about climate change. We have to be together to form a degree of understanding of what that change could look like and actually plan for it as much as possible. And you see that the challenge is that we got people around the world denying cynically that climate change is happening.

I: I didn't hear your last sentence.

P: The crucial thing to recall is to try and mitigate climate change and that means cutting out carbon emissions and looking at that gap and looking at resources and managing them more efficiently.

I: And so, your understanding of resilience would be the ability to cope with the change that's happening?

P: Yes, but I know that answer is not good enough. Because you or I can't tell farmers what the change will be. I mean people are thinking about temperatures being two degrees warmer than average, or four degrees warmer than average, well that's a huge difference. And the water is leaving the world at a rapid pace. So, that's what's frightening everybody,

that it is so dramatic. And in our lifetime, we've never seen this before. All we can do is have the best application methods of water, we can store water as much as we can, but we're asking ourselves are we ever storing enough, you know? And you'll see crop production move from one country to another, or one region to another, where there is more water. Simple as that. Because if you take somewhere like Middle Eastern countries for example, their water is a serious issue. You've also got other issues that prevent us or could prevent us from trading with those countries anyways. Safety, violence, biodiversity loss, the list goes on.

I: And so what kinds of difficulties have you experienced in trying to impact water management, you know, what are the constraints that you work with apart from the uncertainty around climate change? Are there any things that you would like to engage in but can't because of some external factors?

P: No. I think water is very well understood by our growers around the world. Very understood. Effecting change in countries that are outside the EU is more difficult, there's other social pressures. But what I'm just thinking is that, you know, people see water and fertiliser application as the simplistic way of getting more yields. And actually, then I have to come back to soil health again. I'm not sure if I've answered your questions in the way that you wanted me too.

I: That's fine. And what do you think about the things that other people in the system are doing? What should be changed on a system level to increase resilience to water risks apart from what your role is?

P: I think it makes it easier for farmers to get reservoirs on their farms. Make it easier for the water companies to see that resource is part of their overall resource. We've done it in the electricity industry. You know, many farmers gain power and they put it back to the grid, in this sense they could be selling water back to the grid.

I: Are you talking to Defra or the EA or water companies about that?

P: Yes, we are. But not directly. Yes, we are.

I: And what response do you get?

P: I think at the moment people got their minds on other things. But we support applications, they are going through and we're actively leveraging levels of support to make them happen. But it needs to be a joined-up policy within what the government is trying to do with other water policies. But the problem is they're mostly dealing with current issues rather than looking out into the future. But so, have you got what you wanted out of me? I don't think you have, but, I mean..

I: No, this has been good. We've gotten to most of the things that we wanted to talk about.

P: I mean from our side of things, you're at Cranfield, aren't you?

I: Yeah, I'm at Oxford but it's a joint project between Cranfield and Oxford.

P: Ok. Well if you want to ask any additional questions, come back to me.

I: Have I sent you the consent form?

P: Yes, you have, and I'm fine, happy with those.

I: Would you mind sending that back to me? It's not urgent but it would be good to have it eventually.

P: Well I'm out for a few days now, but I'll do it after.

I: Great. Well thank you so much for taking the time and sharing your perspective.

P: Thank you for calling. And it's always difficult when you get set questions. I try to answer set questions, but I also try to get my message across.

I: Yes, I know, it should be fine.

P: Ok. Bye then.

I: Bye, have a good day!

Interview Transcript #22 – independent institutional caterer

November 2018

0:00

Introductions, project explanation, etc.

01:09

I: It's been difficult to get the food service sector involved in the project so I really appreciate you taking the time to participate.

P: Yeah, I think that's sometimes because of the lack of understanding. Lack of knowledge and lack of understanding and generally lack of awareness. Because that's largely driven by metering, or lack of. No-one really has an understanding of what water costs or how impacts can be because they don't really know how much they use. And then also where. No-one ever talks about the water footprint behind fruit and vegetables for example. It's just not something that's talked about.

I: And do you look into these kinds of things?

P: I'd say probably we're not either. Not on a major scale anyway. I think certainly it's part of our overall approach to sustainable business and what we're trying to achieve. I think sort of in terms of fruit and beverage, and certainly fruit and vegetables, we obviously look at, I mean our main driver is local and seasonal. And wherever we can it's seasonal and from the UK. And so it's certainly a grey area, we can sit there in our little ivory tower in terms of food service operators in the UK and think now we're alright, Jack, we've got plenty of water, that's not to worry about. We're wet, it's the UK, isn't it? With no real understanding of impacts of water particularly in the UK. I think there is some understanding of water scarcity in other parts of the world. If you ask anybody about concepts of virtual water, they have no concept of what that means in terms of the fact that someone else is using water in a water scarce area and then you're importing it, so you're adding to their water stress. There's no understanding of that, apart from within the confines of a sustainability professional perhaps, who has actually maybe looked at that at some point. But water is absolutely not in common parlour. Everybody talks about carbon and plastic and waste packaging. And that's it, and animal welfare maybe if you're lucky. But in terms of water, it's just, I don't know, it clearly will be as we move forward over the decade it will become a bigger and bigger issue. No question about it. Of more value than oil.

I: So, you mainly source from the UK. Do you directly source from farmers or do you buy from wholesalers?

P: We, generally speaking, we have a very decentralised supply chain. So, we work very closely with growers, producers and farmers. On the whole we will source them via a wholesaler or supplier because often the farmer or producer doesn't actually have a route to market. You know they don't have the wheels, they don't have the infrastructure, they just grow. That's how it works. So that's why we would often do that. But certainly, I would say a very high percentage. I think it's something like 79% I think it is of all fruit and vegetables that we can grow, i.e. are indigenous to the UK. We would source from the UK wherever possible. Which, you know, which is good, and again, locally. Clearly, there's obviously non-indigenous stuff that we can't get, and you buy it, but also, I would suggest that fruit that...we sometimes are in an interesting position. For example, at this time of the year, we shouldn't have strawberries as an offering. Because clearly they're not in season and we'd have to buy them somewhere else or they would be forced to grow in a greenhouse or

polytunnel or something like that or somewhere else in the world, but sometimes you don't really have a choice. Because we work with inclined clients. That's why we, within food service, or what we used to call contract catering, that's where we differ from retail, from the high street. And from restaurants, bars and so on. Is because we're working for a client. So, we have to work in the client location, so often then they are ultimately the boss. In terms of, if the board of *[client company name]* wants strawberries, then we can suggest they don't have strawberries because of all the reasons we know, but actually if they really want strawberries, then we're not going to say no.

I: To what extent do you feel like your customers are open to your suggestions?

P: They are more open, they are, definitely. And more and more so. Sustainability generally is becoming a far bigger topic for our clients and our customers. And often, our clients, because their staff are demanding in. Surely you can appreciate there is a huge focus on plastics and packaging at the moment. And an awful lot of very misguided media reactions going on. Saying we need to get rid of plastic wholesale, without any understanding of what the impacts of that are. Whether it will be in terms of what other materials they are using, resources, infrastructure, water, we don't really know. The impacts of changing away from plastic have the potential of being enormous.

I: Yeah, food waste and safety as well.

P: Absolutely, I mean, everything. But unfortunately, what happens in our industry, we've got a very large bank and they have been instructed by their head office in the States that they're getting rid of single use plastic. That's it. Headed off. And I've had so many millions of conversations with them about it and about how difficult it's going to be, and it's not going to work. You know, the challenges it would bring. But what a lot of clients don't recognise is things like crisps and confectionery. That is also single use plastic. So, I mean we're not getting rid of that, but that's single use plastic. So, you can't make a sweeping statement saying you're getting rid of single use plastic unless you do it with all single use plastics. Or we're going to get rid of water bottles, but we're not going to get rid of Coke and Fanta and Seven Up bottles. Well, why? What's the difference? Or what's even worse, that we're going to get rid of water bottles, and then maybe put water in cans. Canned water, which is just insane.

I: It's quite surprising how the plastic discussion evolved so quickly and how it's been taken up in comparison to other issues as well.

P: The biggest issue is the fact that, I'm not suggesting that we do not use less plastic or that we need to use it for everything, but actually, the enormous distraction from what really matters. The biggest issues, we have forgotten and stopped talking about climate change. One of the reasons why no one talks about water is because they are so fixated with plastics and packaging. You know, it's a huge distraction.

I: Do you mainly work with institutional catering then or do you also do events and things like that?

P: Well we have, *[company name]*, we're a contract catering company. So, we provide catering in the workplace and also in universities as well. But we're part of a family business, which includes *[catering firm 1]* and *[catering firm 2]* and some restaurants as well. So, we do actually work in the high street. *[catering firm 1]* work within [??] and also work in public spaces and the high street, so they've also got *[catering firm 1]* on the high street, and we got *[catering firm 2]*, and they're mainly event spaces and iconic venues such as *[iconic venue]* for example. So, they do all the public catering at *[iconic venue]*. So we sort of cover all aspects of food service and hospitality but within several companies.

I: Alright. And so what kinds of water risks do you think you're facing mostly?

P: I would say probably at the moment we aren't. Because I would suggest because of our locale of where we are, we don't operate anywhere apart from the UK. We have a couple of sites on mainland Europe, in [EU city 1], [EU city 2], and [EU city 3], and that's literally a handful of sites, but we don't currently operate anywhere where there is particular water stress. And that's to say we tend to buy locally. I mean we haven't gotten to a point yet where we're buying more tropical products, where it's actually becoming evident that there is a challenge around water. But I think that's, that actually forms part of the West and the countries that are not water stressed living in blissful ignorance. Thinking, oh this is all fabulous, we can get our bananas and stuff from wherever we want. But actually, we have no comprehension of what is actually happening at the front end. And I think some of the problem is a complete lack of awareness. But also, in terms of, I suppose from a materiality point of view, what is important to you at the moment, is like, I suppose is like in the UK, currently, and maybe in certain parts of the States and other parts of the world, where the impacts of climate change aren't overly recognizable. It's not something that you can touch and feel. Like in some parts of the world where it's incredibly real. Whereas we've had, you know hotter summers or cold winters or bigger storms or the forest fires in California, or whatever, but actually people choose not to relate that back to climate change. And it's very hard to say that is definitely as a result of climate change. So, I think that people just don't think about water in that respect. They just don't. And people also, a real common thing that I do hear, and I'm sure you do as well, is that people think that water goes around in a cycle and we'll never use up all the water, because you use it and it gets reprocessed and then it evaporates and it comes down in rain and goes around and around in circles. We have no understanding that actually, with the impacts of climate change, it's changing where that water is in the world. And it's interesting, I don't know in terms of your studies, but would people be more careful and more aware, more thoughtful about water if there was more knowledge about it? I think people just don't have enough knowledge about it. Interestingly enough, one of the sustainability organisations that work in foodservice called Footprint have just been doing a study with Meiko Dishwashers around water. And they're about to produce a report actually. About sustainability of water in foodservice and hospitality. That will be coming out soonish.

I: Do you know what the study is called?

P: Interestingly I did a call with somebody from Footprint about it, and it's called, Footprint Media and Meiko the dishwasher people, are called action on water- white paper. So they're just about, well they asked me to prove my quotes at the moment. But actually, they said that the first draft will be available soon, I don't know what that means. But it's interesting, you know, over the last few months I had a few people talk to me about water and it's not something that we can say we have looked at in great detail. I mean we have, I do training on water, energy and water efficiency in locations. And that's more about behaviour within the kitchen. So, making sure that if you have dripping taps you report them. And not defrosting frozen fish on a Friday under a running tap and that sort of stuff. So that's sort of behaviour. But again nobody, I would say there's not a single site we've got, that had any form of water metering.

I: Do you also wash all the produce that you get, and process it from there or do you get things already ready to use?

P: We do it all ourselves. That's one of the differentiators between our business and some others. Wherever we can we get fresh produce and cook from scratch. So, we don't tend to buy in pre-prepared. So, you are in effect losing the efficiency of scale by everybody doing it individually rather than all doing it in one place. But generally, quality is not as good. So, if

you buy peeled potatoes in a vacuum pack that's been washed and peeled, they're not as good quality. It's not. Although things are, people are more aware and I suppose it relates to waste as well, in terms of how we deal with waste. Years ago, every kitchen you ever went to had a potato rumbler. Which just used so much water. People used to use loads and loads of water in waste disposal units. Where the water will probably be running all day, whereas now, food waste does generally not go down a waste disposal unit because everybody recognises that eventually it's going to be a problem when the law changes, the same way it happened in Scotland, is that you won't be able to put food waste in the sewer. So actually, you should be collecting it in AV. And that's good, that's all reducing water. But again, people do not relate at all that the way we're using water in this country will have an impact on water anywhere else in the world, there's no linkage at all.

I: And do you employ any strategies to decrease your water consumption now in the kitchens?

P: No. I would say the only thing, you know, apart from things like aerators on taps and things like that, I would say it's just training, it's behaviour. And that's it, it's not really, because there is no metering, and all about it because you can't manage it, it is very, very difficult because you still got a job to do, but you do it efficiently. So, we still need to, people drink water all the time, you have to cook with water. Where we can we would, for example steam vegetables, but probably one of the reasons, or the main reason for that is around speed and nutrition rather than water, although clearly it does save. So, in our water training, efficiency training, we talk about steaming not boiling because it saves water, it's quicker, it saves energy because you're not heating the volume of water, and obviously probably from a nutritional content as well you're not dissolving all the nutrients.

I: What else is part of the water efficiency training?

P: That's it really. Apart from things like making sure that you stop dripping taps and you don't switch on the dishwasher too soon, and all of that sort of basic housekeeping. That thing, like housekeeping in the home. Don't turn the tap on when you're brushing your teeth, take shorter showers, that sort of behaviour training rather than any sort of interventions, physical interventions I would say.

I: Have you ever had any problems with microbiological issues in water?

P: The only one I can think of is we look after, we didn't actually have a problem with it, but there was potential, there was a pipe. Which I have never come across before which is why our health and safety team got involved, it's where you end up with a dead end of potentially still water in a pipe in the ductwork. So actually, it was about that. But in terms of, no, I mean, microbiologically, no. I don't think so, no.

I: Have you in your sourcing had any difficulties like this summer or at any point before because of water scarcity or also droughts, heavy rains?

P: I think sometimes we've had, yeah, certainly. The water scarcity, the drought during this summer, or the very dry summer we had and then on the flipside we had a very wet period. Particularly where we had a very wet autumn last year and a very cold winter, so we then had all the snow melt and everything else. What it does mainly for us is it increases the price of potatoes for example. Because so many potatoes were rotting in the ground. And things like that. That definitely. Now, if it could be demonstrated that that's going to be increased, exacerbated over time, because there is, there's going to be wetter periods and drier periods, then that's going to be a real challenge for food prices.

I: Then what do you do about it?

P: There's nothing you can do about it. You have to roll with it. Because we still have to provide a service. We still provide food for our clients, so it's either a case of we take the hit

on the cost, the customer does or the client does. And normally it's a cross between somewhere in the middle of all of that. And you just have to go with it. You know, when you go to the supermarket, you know, if there's been a meteorological challenge so we say, and the price of cucumber or whatever goes up, then you just have to, there's nothing you can do about it. The only thing you can do is not buy cucumber, but often that's not an option.

I: Would you at some point consider sacrificing your local sourcing and buying from somewhere else where it's cheaper?

P: I think probably, I'm sure that happens within the business, I'm sure it does. But I would say the way we buy is, it's sort of one of our core values, is that we want to buy more locally and support UK farmers and all of that. Now, I'm sure there's instances where people would buy from abroad, and often after season it is best to buy from abroad because transportation has a smaller footprint than forcing it to grow in a heated greenhouse for example. Or cold storage after season. So, that's when it is more efficient to buy it from abroad, or from the next nearest country where it is in season and where it is more likely to be grown naturally, and have the top of its quality, highest natural sugars etc etc. So, there certainly is that, I mean that's why I'm saying. If we have to buy strawberries now, we wouldn't, I'm not sure if you can actually, I would imagine you probably, if you worked hard enough, you could probably find British strawberries forced in a greenhouse somewhere. But we wouldn't buy them. We would rather buy them from the next available country where they are grown naturally with better quality.

I: That makes sense.

24:54

I: With what kind of planning timeframes do you work as a business? So how far into the future would you be planning?

P: Not hugely because we buy, I would say we almost buy just in time and I would say there are a few commodities where we might buy a greater volume or commit to a greater volume. On a whole, because each and every different location has the choice to use maybe two or three different fruit and veg suppliers for example, they will buy what they buy locally, what's available locally, if it's not available they won't buy it, generally speaking. So, we don't make big deals, we don't sort of, you know, the bigger players of our businesses, the *[large catering firm 1]* and the *[large catering firm 2]* of this world, may do a deal with a business and buy, you know, tomatoes for the year. And agree the price and everything else upfront, but we don't do that. That's not how we operate.

I: And more generally, in other aspects of the business, do you have a three year or a five-year plan or something like that?

P: The company overall has a five-year business plan.

I: And is that as far as you would ideally want to plan?

P: I think so. I'm not on the board, so I couldn't say for sure, but my guess would be, absolutely. I think that the catering, the hospitality market, there's too many variables and it's changing all the time and you also have to be, I mean. Because we are a relatively small company, we are an independent company, and therefore we are quite nimble. And we can move and change through the times. Because what customers want and the trends and everything changes so quickly, it's almost like from a fashion point of view. So, you can't plan so far ahead and put all, literally, put all your eggs in one basket. You need to be nimble.

I: And what was your experience in terms of maintaining seasonal menus? Because it feels like the general trend goes in the other direction. As you've said, you know people want to

have strawberries all year around, so how do your customers react to not having that at their workplace?

P: Very well. I don't think we struggle with that at all. It's rare, very rare, that you would have to have strawberries. And we would ever have that only in a boardroom, if that's what the board wanted, for example for a function. We wouldn't put them in a fruit salad or anything. I mean, it's interesting, we were doing a proposal for another client, for a potential client. And in the meeting room, they had cookies, over coffee and biscuits in the morning. They had cookies, and as a garnish on the plate they had strawberries. It was just so bizarre, it seems so out of place, and I think generally speaking, most people would go "What? Strawberries? It's November!" So, I think people are becoming more aware, and also I would say our clients and our customers know what we do, and so they understand that and that's what they bought and that's what they've chosen. A business that likes to consider itself aware of sustainability and seasonality and local availability, buying from local communities and all that. So no, we don't have an issue with not having products. If a customer says, why don't you have this, it just doesn't grow. We don't have strawberries in our fruit pots this time of the year because there aren't any strawberries. And we don't buy them from abroad. So, sorry, we don't have them. That's it.

I: Are you aware of any strategies that you could use to increase your resilience to water challenges that you're not using at the moment but could think about employing.

P: I mean, I don't know. From an availability or a cost point of view, or product?

I: Both in terms of managing availability as well as with preparing food in your kitchens.

P: All you could do I guess is, as we've just said, you could buy further into the future. So, you could have the price for strawberries for the year, and say we're going to buy this many strawberries over the year, and in terms of time this is the volume we're going to buy, and commit yourself in that way, but as I said that's not how we operate.

I: And in terms of new technologies or machines for the kitchen, there's not really anything water related coming up?

P: It's interesting, actually. Because there's some technologies which people have put in which I worked very hard to get taken out again. So, for example, there's a waste digester, which is a food waste digester which you put in your pot wash area, instead of having food waste collected, which is the best way to do it. But actually, I don't think we've ever seen one of these, and it turns the food waste into grey water, and the grey water then goes down the drain. These machines are insanely expensive. And if you look at the small bit and it's always when you look at equipment, you're actually looking at how much water and how much power they use. They use 600 litres of water every 24h at a steady temperature of 60°. And that is 365 days a year 24 hours. And if your mains can't provide that, then you need to have a separate zip boiler. I mean some things you look at, you go "Oh gosh, that's just so insane". There's an international machine company that makes dishwashers and all sorts of stuff, and they have, they sell now a kit that you can, effectively it washes food waste. So, it washes the food waste so that all the liquid then goes down the drain, so effectively it's reducing the amount of weight of food waste, so reducing the amounts of collections you would have. But it does that by using gallons and gallons of water, and I think that's one of those things that like energy, in my view, electricity is not expensive enough for people to take it seriously. Unless they're environmentally focused, and it's the same with water.

People don't think about water because it's so cheap, and it's ridiculously cheap.

I: In this example, is food waste collection that expensive that it makes up for it or do people just don't calculate it through?

P: It's not that expensive. I mean it's just the amount of work and effort and, probably they should be paying extra on their affluent if they are putting any type of food waste down the sewer, the increase in equipment themselves, I mean this IMC Waste Station, I think it was in something like 20,000 pounds to buy, then you got to install it, and the water, obviously the cost of water and power. But actually, for the cost of that machine, you could have that volume of food waste collected every week for seven years.

I: So why are people buying it?

P: Because they're not aware, they're not doing this calculation. And we have sites which say, we are thinking about putting this in, what do you think? They have a very good salesman ring them up and they say, you know, we can solve your food waste problem. You know, they chat them out of their mind, we can deal with all this for you, this machine will do all this for you, it reduces your food waste being collected by 80% etc. etc. But you go, actually, hang on, for the price of the machine and the water and the energy, we can actually collect it, take it to AD, have all the good stuff AD does in terms of gas to grid, energy production etc, for seven years for the price of doing that. It's ridiculous. And that goes back to what I said at the beginning, is just generally a lack of awareness. People aren't being bad, people aren't being, you know, they just don't know. And then they get sold a dream by some clever salesman.

I: Right. Do you have any understanding of how much water you use for washing produce in comparison to other water usage in the kitchens?

P: Unfortunately, not, again, because there's no metering. There's no methodology of calculating how much you use it at all. I have the same issues with energy, too.

I: What would be your intuitive estimation?

P: I mean, if you're washing produce, you know we have within the training, it's about, for example, you don't need to wash under a running tap. Because quite often you would see that. While actually the tap would be running, and someone would wash their potatoes, cauliflower, any sort of veg under a tap, a running tap. While actually you can put enough water in the sink, tap the sink, and then just do it with that water. We would always maximise water use by using a dishwasher as opposed to washing by hand. Washing by hand uses a huge amount of water in comparison. Again, people don't realise that until you point it out. People would think that the dishwasher would be worse, but as long as the dishwasher is full, obviously, then it's much more efficient to use a dishwasher.

I: But there's no such thing as a vegetable dishwasher in a way?

P: No, no. Absolutely not. I just think there's a huge gap of knowledge. People don't comprehend the value of water because in the UK it's plentiful. It's rare that we are, even with the very, very hot summer we had, you know. And then what was going on was a hose ban, you know, my lawn at home was something like dusty dirt. My next-door neighbour, there wasn't a hose ban then, so it wasn't illegal, so he is out watering his lawn every night. There's just so little understanding of actually, you know, the bigger picture.

I: Yeah. And apart from increasing education and awareness, what do you think could be done in the bigger picture to improve water management?

P: Certainly, within the UK I think there's probably still a huge number of leaks around. Again, I think there's a lack, the lack of value of, or our understanding of the value of water goes right to the top. Just generally. If it was oil in pipes under the ground and it was gushing out the side of the road and there's a flood, they'll get to it in the case of water eventually, but if it was oil it would be fixed pretty damn quickly. National infrastructure is obviously very historical, and I get that, it's old and antiquated and lacks investments. Since

privatisation I think there should also be a whole new conversation about that. About the profit, and things like that shouldn't be for profit in my view.

I: And are there any water management practices in terms of fruit and vegetables that you think are good and should be maintained?

P: Within what we do? Or within the supply chain?

I: Both.

P: Probably what we do is obviously the training to raise awareness, people are more cautious, more understanding. But actually, you know, you got to realise that you effectively, you're paying for water twice. You're paying for it to come out the tap and you pay for it to go down the drain as well. And people absolutely do not think that you're paying for water to go down the drain in terms of sewerage rates. It's amazing, if you say that to them, they look at you in disbelief. Because there's just, again, I've said it time and time again, lack of awareness, understanding, and what goes into making water possible. What's the process for water to actually come out the tap. And it goes down the drain, untouched, you haven't used it. But the energy and the work that has gone into purifying that water to make it possible, then to go down the drain again and go around in the circle is just incredible. It is amazing, but what needs to happen to get people to realise that is a huge awareness piece. But one of the challenges you have in the UK is that we don't have that scarcity in the UK. So, it doesn't feel real, you know. In the same way as I've said before about climate change. Because we're not having the, we are having the bigger storms and rains and drier seasons, but it's not particularly related back to climate change. Or maybe people choose not to think about it in that way.

I: Do you think there's any group of people who would have a different view to you in terms of water management?

P: I'm sure, producers and growers would. Because obviously I would imagine, because it's literally their bread and butter. I mean we have fruit and veg suppliers and growers in Kent, and you know they would have been very water stressed, I'm sure, during the summer. And worried about harvest and worried about whether their tomatoes were going to get any size at all because there was just no water for them to eat, no natural water. They had to water everything obviously which then puts their prices up and exacerbates the problem of water stress.

I: Ok. So those were the main topics that we wanted to talk about. Is there anything else that you would like to comment, or think is missing from the discussion?

P: No, other than I think there is definitely a need for greater awareness. I think that people are mis-judging the importance of water for us. It's the single thing we need to sustain life, that and oxygen. Not just life itself but everything that grows around us. And I think there's a lack of understanding of the value of that and how important water is. It's interesting, a friend of mine has written a series of books set in the future about water, it's called *[name of book]*. *[Book details]*. In the future there will be wars over water not over oil. And I can see that becoming a reality.

I: By any chance, do you know of any other caterers or people in the food service sector who we might be able to approach for interviews?

P: What I'll do, the person who has contacted me, I have no idea how they work and whether they would be willing to talk to you or share information that they collected as well. But that might be quite interesting because I've had a similar conversation with them. And then maybe, I don't know how many you spoke to in terms of actual producers, farmers of fruit.

I: We have been able to talk to a lot of farmers and retailers as well, but food service has definitely been the most difficult and I also acknowledge that right now people are very busy because of the pre-Christmas work.

P: I mean I could put you in touch with the environment manager for *[large catering company]*. I have no idea what they are doing or if they're doing anything with water, but I could certainly pass over her details to you and you could email her. To see if she'd be interested in talking to you.

I: Yes, that would be really good.

P: Ok. I'll send you an email about that.

I: Perfect, thank you. One last thing, I think I sent you the consent form and the information sheet.

P: I'll fill that out, and sign it and scan it and send that over to you. Ok?

I: Great. Well thanks so much, this has been really helpful.

P: It was an absolute pleasure, no problem at all.

I: Have a good day!

P: Cheers then, bye!

I: Bye bye.

23 Interview transcript with a national environmental agency

For the [environment agency] water department, what are the key water related risks faced by the UK's FF&V?

In a regional context, water in terms of quality and as a resource do not pose any constraints or risk to the F&B sector in NI.

Many growers do not need to irrigate their crops due to high rainfall however where extra water is required for irrigation or washing of produce this is invariably sourced from groundwater via boreholes. These abstractions are licenced by [environment agency].

During the summer of 2018 due to a prolonged dry spell a number of growers needed to irrigate their crops and applied for time bound abstraction licences to do so. This was a temporary issue.

2. How does the [environment agency] water management department give weight to these different types of risk, and how does it seek to address the issues that lead to or amplify them? (Please provide examples.)

Refer to Q1 above.

3. How does the [environment agency] water management department understand the concept of resilience? How does it measure and monitor the resilience of the UK FF&V System?

[environment agency] looks at resilience in terms of the ability of the water environment to maintain or enhance water quality and sustain ecosystem services in combination with providing a resource for industrial, commercial and domestic uses and acting as receptor for discharges from these sectors.

[environment agency] monitors resilience through a system of water quality monitoring for chemical and biological parameters and utilising flow data. This information is reviewed and analysed for site specific purposes but also in a sub-regional and regional context to determine any medium or long term trends. This data allows us to input into models to determine the extent of the available resource and also the carrying capacity of waterways as a receptor of discharges.

4. How does the [environment agency] water management department contribute to the UK's resilience to water-related risks? How, for example, does it factor these risks into future planning and water-risk management strategies? Have there been any water events in the past which significantly impacted these strategies?

As the [environment agency] we will contribute to overarching strategies and provide expert opinion. Two such relevant strategies are as follows:

- Northern Ireland Water Ltd (NIW) Water Resource Management Plan;
- Sustainable Water – A long Term Water Strategy for NI.

A significant freeze – thaw event in 2012 had a high impact in NI, with many industrial, commercial and domestic water users losing supply for a prolonged period.

5. What features of the UK FF&V System must be preserved as a matter of [environment agency] water management department's future water-risk management strategies?

Increased sustainability within the industry is required in terms of sourcing water supplies locally to sites and also more innovation is required to dispose of produce water without having an impact upon the water environment. Currently, in NI, water from the washing of F&V is either spread to land or discharged into sewer. These 2 outlets can impact upon the water environment negatively under certain circumstances. For example, if land spreading is done inappropriately discharges can enter watercourses and starve them of oxygen due to the high BOD of the effluent. Discharges to sewer from expanding businesses can quickly take up capacity within a sewerage network and WWTWs.

6. What features of the system should not be changed?

Businesses in NI are increasingly harvesting rainwater for use in their processes.

7. What do other stakeholders need to do to improve the resilience of the UK FF&V System to water-related risks?

8. How does [environment agency] water management department engage with the UK FF&V System stakeholders regarding water risk management? Please provide examples of how the activities of the UK FF&V System stakeholders enable or impede the implementation of strategies for water-risk management.

There is currently no dedicated Group established by [environment agency] for this sector. However [environment agency] hosts annual Catchment Stakeholder Groups within the 3 WFD River Basin Districts in NI at which a range of stakeholders, including the agricultural industry are invited.

The disposal of produce water from some FF & V establishments has resulted in water pollution and in some cases fish kills, due to the high levels of BOD. Any new or expanding businesses have to be able to identify a sustainable outlet for their effluents.

9. What short-term timeframe does [environment agency] water management department employ to address shocks related to water and the UK FF&V System?

[environment agency] undertakes a cyclical catchment based planning process with a view to maintaining or improving water quality in line with the requirements of the Water Framework Directive. As an outcome of this cyclical business planning process [environment agency] publish River Basin Management Plans every 6 years.

10. What long-term timeframe does [environment agency] water management department employ to address changing trends in the UK FF&V System?

See above, in relation to river basin planning timescales, but not specific to the FF & V sector.

11. Which other groups of people/organisations might have a different understanding of these issues? What key points would they be raising?

You may wish to discuss this question through a telephone follow up.

Interview with a fruit and vegetable wholesaler

We are a group of companies, and I am technical manager for the whole group – the different companies are under the same hat, so we have wholesale, prepared – which does prepared fruit and vegetables, catering – fruit and veg and frozen, dairy and bread supplying hostels, schools, restaurants – frozen, and another company in [South of England] which supplies schools and the catering industry in the south of the UK. We have [wholesale company name]'s transport which is based in [South of England].

I make sure that the whole company complies legally regarding quality – I will explain a little about myself: I have worked as a production manager in [South of England] which was bought by [wholesale company name], which means that I have had to relocate to [South of England]. This is how I started my career – now I am overlooking the whole company – so I have a different person in each part of the company making sure that all of the procedures and all the policies are followed, that they are filing all the records, the due diligence, any complaints from the customers to make sure that they do not occur again.

Agreeing the specifications for the products – when we have audits, we have BRC certification so I am taking care of those audits. Being present with the Auditors and to represent the company.

Does water form a part of the specifications and audits you deal with?

Water is not necessarily a part of the audits, but it certainly has an impact on the products we are buying. For example, we had problems with lettuces and potatoes, and for the prepared company – if the crop is not of good quality – because of the weather – we had this problem in spring time 2017 – and this year we had a problem with the potatoes – it will have an impact on the pricing as well – on determining the price because of the yield and the production timing – producing smaller potatoes – you don't get as much as you would when the crop is of a good quality. With the lettuces as well you will have more waste with a bad product instead of a good one.

Can you say a little about what the issue was?

There was either not enough or too much rain. With the potatoes this year, the problem was not enough rain so it has delayed the crop. But in other countries in Europe it has been a case of too much rain.

So is it about negotiating the price down? Or is it about finding different suppliers.

We do have our suppliers here in the UK but if we cannot find the product then we source it from Europe or Africa, it depends. But, the main impact this kind of weather has is on the pricing. We had a problem with carrots this year – the price was very high – it is how it is... – and we had to advise the customers – the same with potatoes.

Do you think about these problems you have in the past and how difficult it might be in the future to secure the price, quality and quantity you require?

Yes we have noticed over the past few years how it has changed, if we knew that the product was available, let's say we know the seasonality of a product we can buy for a certain price at a certain time – this has changed. We could say that for the next four months the product will be in season, but this has changed with the weather conditions. So we cannot rely on this certain pricing. It has become a little bit uncertain. We have discussed this, but it is more for the procurement department. I believe they are trying different suppliers, and even to change from one country to another – so what they can't find here they will find it somewhere else.

How does that work?

The procurement team has a lot of experience behind him and he knows a lot of producers, there are lots of phone calls and emails, even visiting Spain a few months ago.

How long has [wholesale company name] existed?

About 20 years.

So there is a lot of experience behind the company?

Yes the director's all have a lot of experience, all with 10, 15 years of experience in the industry.

Do you have any thoughts about how this experience will be transferred forward going into a more uncertain future?

Not really. I think it will be more up to the farmers and producers. We just buy and re-sell or process the products. But, we cannot ourselves, I mean we can find strategies for procurement...

Ok so let's think about the specifications you work with, are these changing?

We review and agree the specifications each year – some of the products that were easier to find within the spec, are now starting to be a little out of spec. and the clients are a little more flexible with that.

Say for the size of tomatoes which have to be within certain sizes, 10mm and 20mm, they would not have accepted anything outside of this spec. but now if they are 8mm or 22mm they will be accepted. This has also been a part of our effort to reduce waste and to be more open with the sizes of the products.

With waste reduction, as a group, with different companies, with the wholesalers and the catering industry, sometimes the restaurants, they do not accept some of the produce, but the prepared foods can use the products instead. So it helps to reduce the waste.

Was it part of the overall initial strategy to use unsuitable fresh products in the prepared foods business?

I don't think that this was intended in the first place, but it has been developed over the years.

How might the industry become smarter, find these types of opportunities such as this? Where does the information come from that supports this type of strategy?

Some of our clients actually request, and talk with us, and our management works to reduce cost and waste. We have, for example, we have adopted a new information system that is reducing paper waste. It is a change that is working its way through the whole industry. Most of our clients have asked for digital copies of their invoices.

It has changed a lot in the last 3 years.

It has become more environmentally friendly month by month.

As a technical person, do you also interact with other technical people from around the industry, say through conferences or anything like that?

I have been to different courses and normally we discuss what we can improve in what we are doing. For the company to work better, but also to reduce waste, to manage people better and all sorts of tasks.

Does [wholesale company name] work with farmers?

For our procurement team, we have direct contact with farmers here in the UK, but outside of the UK, Europe, Africa, South America - it really depends on the product we buy from other wholesalers, Brokers.

Have you noticed that the types of fruit and vegetables from your clients have changed?

Definitely. Chefs and airlines have begun to request micro salads in a big way and other forms of micros. It is really driven by the menus and what the customers are requesting.

Interview with a water regulation company

Perhaps you can say a little on how [water regulation company] interacts with growers and processors, and how they form part of your work.

In terms of what we are looking at, and what we are responsible for... we're the... the water industry

And part of our duty in that area is to promote, or to make sure that the companies are promoting resilience. So in terms of one of the areas where I have worked, experiences in the engineering part of [water regulation company] and the analytics team, so we have been involved with water resource management planning, alongside [government environment group] and the [government environment group]. We developed the advice for water resource management planning, so setting out what we expect companies to do in terms of planning for 25 year plus into the future to ensure that supplies to customers are resilient and that the companies are maintaining the level of service they specify. So it is probably of interest, because there are a series of levels of service that companies talk about.

Temporary use bans, hose pipe bans, the next level is non essential use bans which affects some commercial enterprises, and then the fourth is stand pipes which is the most serious... so the companies will state a level of service... for example 1 in 200 years, they will be maintaining a supply to customers up to a 1 in 200 year drought event. And we have given them that advice, and as a part of our statutory role in the water resources process, we review the companies draft plan and we comment on them, and that is part of the link that has since so we provide representation ... the state... for English companies and the Welsh government, for the Welsh companies, and we review the plan and... the companies will obviously be looking at domestic household demands, and non household demands, but then they should be talking to the non-houseside, retailers, making forecast plans going forward...

Can you provide an example of a resilience plan? What types of strategies?

We push water companies towards taking a twin track approach... so we are looking for the companies to manage supply and demand. On the supply side, we are looking at potentially developing new sources, a supply from a new river, they might take a supply from the ground, a well, a borehole, trading between companies, we are looking at companies in water rich areas to trade with water poor and water stressed areas – and we are looking to companies to reduce leakage which is a big topic... and we set them a challenge to reduce by a minimum of 15% of their leakage levels. And on the demand side, we asked the companies to work with customers, so household and non household companies, to make sure there is an efficient use of water.

There are 19 in total... privatised water and sewage companies. There are a number of water and sewage companies, and water regulators who are producing these plans.

What would be your definition or objective of maintaining resilience over such a long timeframe?

There would be detail in the guide, but I am looking for companies to look at resilience wider than just drought resilience and water resilience, but for the purpose of this, I will focus on water resilience.

So we are looking at companies to take into account the changes that might happen over time, and their various different impacts, such as climate change, and potential reductions in abstraction, to maintain stability in rivers and water bodies, the framework directives to maintain stable abstractions to protect the environment, the rise in population, so we expect companies to take those challenges into account

and to demonstrate how they affects their particular area, and to demonstrate what actions they can take to ensure a stable supply. Maintain the supply demand balance in the future.

What we looked at this time round on the guidance, is for companies to consider their resilience to a 1 in 200 year drought, because previously the guidance haven't specified a timeframe to look at, so companies took various different tracks. So we want companies to look at their resilience to a 1 in 200 year event, and to understand what it would take to become resilient to such an event and also one of the things is to engage with their customers, and to see what their customers want in terms of service, and use that information in their decision making process regarding their plans. All around water resource plans, there is long term planning where 25 years is the minimum.

Just for reference companies also produce a drought plan which is an operational plan, which will deal with periods of drought, so we have two sorts of plans looking at resilience.

Do you know how the companies discuss resilient thinking with their companies?

Something that I can point you towards is the companies websites they publish their plans, and within that plan they talk about the engagement with their customers, the approach, and the amount of customers they have spoken to.

Typically they have a range of simple interviews and discussions with customers, and getting customers involved in more elaborate events, so working with scenarios, and scenario games – gamification. And getting customers to select which options they would take in a particular scenario, imagining that they were the supplier. Engaging them online, using online communities, and also companies are speaking with domestic and non-domestic companies to understand their needs.

They are looking at willingness to pay, so how customers value services, preferences, and techniques to understand what customers value, and how they would rank various levels of service and options.

And so the strategies get passed on through to legislation and price mechanisms? Or is there a more voluntary aspect (to more sustainable water use)?

So the companies that produce the water resource management plan – we're a statutory consultation process, but the plan may or may not be signed off by the welsh government or the secretary of the state, and we will give our opinions into that process and eventually it will be signed off, and the process after that will be the companies bringing forward their business plans, and that will include a 5 year cycle, to [water regulation company], and in that business plan they will state what investment they will need with a justification for the investment, so for supply and demand, and maintaining supply to customer and that is what we are reviewing at the moment. And we expect that they have engaged with customers and we expect that the companies have followed our methodology that we have set out and for example where we have stated the importance of reducing leakages, so reducing leakage by 15%, we have emphasised the importance of reducing per capita consumption so helping customers with water efficiency, we are in the process of reviewing that now. And based on what the companies have presented to us, at the end of the process we will define from a price control what money they are allowed to recover from us which we will then use to set their bill.

What mechanisms do you use to ensure compliance?

Well we will review the plans, and if the plans happen to be of a poorer quality then we would not be giving the company an allowance, an allowance to what is justified. The companies have a performance commitment to deal with leakage reduction, which will be incentivised, so performance incentives – so companies that perform very well, can get some out performance payments, the companies that perform poorly will be penalised. And for this price review, we also have performance commitments to do with resilience as well, specifically drought resilience, I can send you a link to that if you like.

And do you know how they water companies pass that on to their customers? So for example, a number of the producers I have been speaking to have said that they have leakage problems in their irrigation systems and they would like to reduce that – but that is a challenge for them...

Ah right, so obviously the companies are focused on their own networks and reducing leakage and managing that – what we did last year, we opened up the retail market, so commercial users can choose to buy their water from different organisations. So the wholesaler, the big water companies that are producing the water and managing the network remain the same, but the companies selling the water are different, with different billing and processing. So the idea here is that the retailers can offer added value to their services and part of that service to their commercial customers is offering assistance with things like leakage, and that was one of the main drivers to opening the market for water.

Has that been taken up well?

Yes. We have written a number of reports on it, reviewing how many people have switched suppliers since it started, and I can probably send you a link to that (it's not my area - I just have general knowledge on that) but we are expecting that the added value activities such as helping customers reduce leakage and helping them to improve water efficiency will become more apparent as the market matures as well. Because it is still relatively young at the moment.

And the number of customers who have taken the opportunity to self supply – so that they have become their own water supplier, managing their own systems that way.

Are you also involved in giving out licenses? So winter and summer abstraction from boreholes and rivers and that sort of thing?

No. So water use and water abstraction is an interesting area to look at though. That is governed by the EA in England and in Wales it is the Natural Resources Wales so they are the custodians of licensing for the various sources. One of the things that they have been involved in recently is the abstraction plan for England. So the government has produced a plan of how they want the abstraction licences and abstraction management to evolve in the future. Part of that is looking at work on localised catchment level, so that is involving various different abstractors, and getting them to work together to enable an effective use of water resources, with the aim of taking the stress off stressed water resources, and providing an opportunity for the trading of licenses in real time between various users. So at times of excess water in the system, water users could trade their licenses temporarily with another water user who could then take the water that they need, store it, or use it – so that is probably worth you looking at actually. The abstraction plan.

Do you engage in formulating these policies at all?

We have been consulted on it and we have fed into it, but it has principally been driven by EA and Defra, but some of the key things have been the use of markets and the predation of trading. And one of the performance incentives that I mentioned before was an abstraction incentive. So we are incentivising companies, or rather asking them to come up with an incentive mechanism to promote using less water from sources that were stressed. We have asked companies to look at that in the last 5 year period and the next 5 year period of their business planning.

Has anything come out of that?

At the moment there are some abstraction incentives, but at the moment we are reviewing that so it is a little difficult to say exactly. But it is definitely part of our methodology to ask companies to promote it.

Are you able to comment on the main challenges to resilience?

Not specifically. But I suppose that they will be facing the same challenges of climate change, the water framework directive, and making sure that the use of water bodies is sustainable and that the environment is protected. And I guess, part of it will be looking for opportunities to work effectively at catchment level as well as understanding how to effectively use each source. One of our key themes is innovation as well, so I imagine that that will be a challenge for any company looking at ways to use water more efficiently and more responsibly.

How might you be affected by microbiological risks that come from agriculture? So contamination and things like that?

So obviously the water companies treat water to a standard, a drinking water standard, a potable treatment standard, and that is regulated by the drinking water inspectorate. So there is a very set level and parameters that they need to keep to and need to perform to. And that is also linked to some of the performance commitments that the companies have as well. And so companies will probably have to adapt treatment processes depending on what is happening at the catchment level and what is being used in agriculture. So I know that when I was at a water company previously, the challenge is pesticides and it is now about finding the most effective way to work with people on the catchment, so catchment management which has been something of a positive in recent times – working with farmers working with land users to use alternative chemicals and pass on best practice for how to manage the land and also undertaking activities on the land to make it more resilient, to reduce the amount of pollution and to reduce the channeling of pollution into water sources.

How do you transfer this kind of knowledge and processes?

Generally across the sector there is a number of research groups, so Water UK that represents the water companies and they will typically get involved with research by different organisations like WRC and ... and typically companies – this is totally from my past – and the companies will all put some money into the research projects to look at best practice techniques and take part in a number trials for the best way to treat various chemicals in the water. And on the catchment side, I think companies talk to each other and have some involvement there with the EA for best practice on the local level.

You mentioned that you wanted to encourage water exchange – a few producers have also mentioned that. Is something like that already in place? What would you think about that?

Generally what we are trying to do at the moment is encourage water-trading, between areas with a lot of resources and areas that are water scarce. It is a good option to consider, but with all of this it is important that it is the best option for all of the customers involved on both sides, so for those exporting and for those importing. What we have done is, with our methodology, and within the previous price review, offered incentives towards trading – there are regional groups that are involved now such as Water Resources SE and WRE – two of the big ones the ones further along and further developed. So looking at optimised solutions and the challenges they have faced, looking at how companies can share and trying to work out how to trade. Trading is a big thing that we want companies to look at and investigate going forward – strategic options, and making sure companies look long term, because these options will involve a lot of investigation and a lot of work and making sure that is done to time – a timely amount and in sufficient time to guarantee investment from the programme.

What do your trading incentives look like?

I'm not sure of the details. One of the other things that we have done recently is asked the water companies to produce market information on water resources, so the idea of this is for the water companies to show where they needed water and provide an opportunity for third parties to come to the water company and offer them resources if they are available – that is what we are referring to as the Bidding Market – so where third party companies can come to offer water resources or where companies can provide a new supply or manage the demand in the area. So we have asked companies to publish demand for the area in order to show where they might need water, where they might have a deficit that third parties can come in and help with. So that is another way that we have been trying to promote the market and trading.

Have you felt any effects of the drought or dry summer this year?

We're not monitoring water use on a daily basis, well companies are reporting to us annually, so we will see the effects of that next year in the annual report. In terms of resilience, we have encouraged companies to come up with ways to deal with these short term peaks in usage, and to have sufficient plans in place to manage them. Because there is potential for an increasing challenge with climate change.

One of the other issues is freezing earlier in the year. So we have asked companies to look at how they have managed that. So what happens where customers have been cut off for a couple of days and to highlight strategies of good practice, and areas of weakness...

END OF TRANSCRIPT

Interview with an organic food company

D: So, I am the raw materials technical manager at [organic food company], my role revolves around liaising with the buyers we have internally as well as the suppliers we have across the supply chain. We have one main grower in the UK, and I am responsible for dealing with him in terms of our 3 year quality plan – we would highlight various areas for improvement across statutory and agronomy levels. Although our growers have agronomists in place to manage things in soil such as nitrates and various other elements, and other things to do with agronomy. Our sustainability strategy and ingredients is a big one. We want to make sure that all of our ingredients are ethically and sustainably sourced by 2024. So questions like this will help, will really be of benefit for digging into that.

G: What do you consider to be the water-risks to your part of the UK Fresh Fruit and Vegetable System?

D: It really depends on the area – the three main risks are centred around drought (particularly this summer), abstraction from river sources where there can be pollution risk, and abstraction from water sources close to the coast where there can be problems with saline water.

G: Do you have any specific examples of how pollution risks, and saline risks have presented themselves as risks? Have they become issues in the past?

D: I don't have any particular examples... (call drops out)

D: But this is something that the growers have raised. I can go back to them with the questions though, to get some additional feedback. They would be more than willing to answer further questions, because it was quite a lot of information to take in at once.

G: If you could ask for some thoughts on how pollution and salinity risks will affect your growers, both physically and as a concept that would be helpful. Salinity risk has only come up a couple of times, but it would be great to provide some deeper thoughts on and examples of how salinity risk fits into the portfolio of risks. That would be great.

D: Well actually, one of the key things was that salinity risk stems from the drought risk, so, as water becomes scarce, you are abstracting water closer to the coast. So one of the key things was that abstraction shouldn't take place during the summer, and we should be using reservoirs to store water during the winter months, during heavy rainfall, for the summer.

G: Was the drought this past summer noticeable in your production processes?

D: Yes, well that was one of the things, if we hadn't had a reservoir in place we would have had a crop failure on carrots. So, from our point of view, having contingency in place was a huge benefit – otherwise we would have had a complete wipe out...

G: No doubt carrots are a significant ingredient for your product?

D: Totally, it is one of our most used veg.

G: Were you feeling comfortable knowing that you had reservoirs in place, or was it a little touch and go? Did you have any thoughts about where you might source carrots from otherwise?

D: In terms of the grower we have in place, we are well aware of their sustainability strategy and their plans for creating a buffer, so it wasn't something that we considered a risk at the time and we

were always reassured that this was in place. We weren't really forced to look for carrots anywhere else. We always felt safe in the knowledge that they had a buffer in place.

G: Did it get close?

D: In terms of capacity – this reservoir stores 33 million gallons of water so enough to see you through the growing months of this particular crop.

G: Do you have any other ingredients that didn't have that buffer?

D: Not that we are aware of to be honest. But from speaking with other growers, for instance down in the South of Spain there was some worry there in terms of drought and lack of water availability, so that would have affected our sweet potato crop – but because of the way we had contracted we had enough contingency in place which meant it didn't affect us. But this is another area outside of the UK that we would consider a risk.

G: So would it be fair to say that you have contingency in terms of buffer capacity in the form of a reservoir and in the form of alternative contract sourcing?

D: Yes definitely.

G: And is this on purpose, or is it just how business works and these strategies just happen to be built into it? I guess I am trying to make a distinction between the two...

D: Yeah, well it is something that needs to be built into organic farming compared to conventional, looking back at the carrot, our growers in [North of England] expressed concerns over the conventional carrots, as they were a lot smaller than the organic due to the level of water availability.

I'm not sure if it is paramount in organic farming but it is something that our growers were aware of.

They are fully aware of the issue and passionate about doing something about it. And lobbying the government was one of the suggestions they had for improving resilience in the supply chain. And the fact that the government is issuing grants makes it attainable for farmers who are willing to invest. They have highlighted their concerns for the supply chain itself. If you do a risk assessment of the supply chain – and realised that growers only had abstraction licenses in place and didn't have long term plans - they would be considered quite high risk.

G: Can you say a little about the interaction with the government? Do growers seek out an interaction with the government, or is it something that the government engages the growers with? Does [organic food company] have that sort of support?

D: It is something that organisations such as the Organic Farmers and Growers Association will work with, that is one of the routes will use. But in terms of [organic food company], lobbying isn't something that we have engaged in as of yet.

G: Did you have any thoughts on what might need to be improved?

D: So in terms of desirable things to do, improvements would include increasing the sources of abstraction so rivers, boreholes and in the winter months have reservoirs to fill. As I mentioned before our growers have a 33 million gallon reservoir in place, which was quite useful during the drought season – that was quite useful.

It was more targeted on improvements – but it might be linked back to getting growers involved in lobbying the government, and encouraging the installation of more reservoirs.

G: Can you say a little bit about how improvements might relate to water use, as opposed to water-availability.

D: Just as a rough calculation – for water use per acre – there was a lot of information to go over on the phone – but they would probably be willing to share the data with you.

G: Can you say a little about how the relationship between you and your suppliers has developed, it would appear that you have quite a close relationship in that you are both willing to share information with each other, talk over the phone and so on. It isn't all organisations that are like that, are you able to say a little about what makes you different?

D: Well we are a values led company, and one of our main values is to be open and honest, which I guess paved the way for being open in terms of communication with our suppliers, and I guess that's why we have such a good relationship with them. I suppose they also see us as the number one [type of organic food company] in the UK so I guess it is in their interest too, to be open and honest about their growing conditions which could impact our product. That is probably one of the reasons we have such a good relationship with them.

G: So I guess it has a lot to do with all the work that has gone into developing the brand, there must have been a decision at some point from the directorship that [organic food company] was going to be a sustainable, organic company...

D: Yeah and we have just been certified by the organisation B-Corp, which is all about using our business for good, and I guess that is another incentive to build up relationships across the supply chain.

G: To become part of B-Corp and force for good, this kind of value system, how does this work? How do these opportunities arise? And then how do you follow up on them?

D: It really has to do with the sustainability side of the business, and networking at a higher level, but it also delves deeper into it, there are a lot of questionnaires to be filled out and there is a lot of work to be certified b-corp. But in terms of getting involved in b-corp initially, it is also about seeing other companies and how they have been involved and how well they have done. Just being part of that extra network really.

G: Has it been measurable at all? To be a part of that approach or program?

D: In terms of monetary value I'm not so sure about that, but I think it is about building a greater network across businesses, and aiming to be more sustainable and better for the environment.

G: Does it help with knowledge exchange?

D: Absolutely, that was one of the key reasons for joining. To have that extra knowledge resource and being able to compare ourselves with others, to see where we could make improvements. It's a way of challenging ourselves on that aspect as well.

G: Has there been any water specific themes?

D: Not that I am aware of but certainly something that can be brought forward in the future.

G: How about what needs to be preserved in the system and what needs to be changed?

D: The main thing was that farmers could potentially give up some of their abstraction to fill reservoirs throughout the winter months, and that was one of the things that was raised by our grower, damage to the environment. The EA would have put a ban on abstraction this summer, because of the knock on effect on fish stocks...

That was linked to the flow of the rivers, and that a steady flow of water is needed to help the fish grow, and abstracting from such sources would result in depletions in fish stock.

This was something that the growers mentioned but I am not sure where they got the information from.

G: What parts of the supply of your product is flexible? As opposed to the supply of ingredients to make your products?

D: We would certainly look further afield for another source of the ingredients for the products – and we would have to make sure it was organic, that would be the route we would take.

G: Do you think there are other parts of the system, external to your supply chain, that shape or impact your business?

D: Thinking of our supply chain, it is important to consider the environmental conditions, it would be one of the factors, it would be important for us to conduct a risk assessment across the whole supply chain... so also looking at our suppliers in other countries, making sure that they have their contingencies in place and that they are lining up with our agenda.

G: And Timeframes?

D: Short term shocks as a part of our risk assessment – one example is whether the growers have irrigation licenses in place – if they didn't that would be considered a high risk supplier. They should really have their irrigation licenses in place, so that is a prerequisite. That would be something that we would need to address immediately really.

In the longer term, it is about risk assessing our suppliers. So if we know that our suppliers have investments in the pipeline that would give us greater re-assurance. That is where we are in terms of timeframes.

This has just been a conversation we have had with our growers in the past week, and it has certainly raised some questions for us, particularly in terms of the short-term and longer-term risks – the work that we need to do, to ensure that we have contingency in place to avoid any forces in the food supply.

G: Can you say a little bit more about the nitrates topic you were interested in?

D: At the moment it is still a work in progress, we are putting together a workshop that will involve all our growers and various academics from across the supply chain – and with a more in depth agronomy aspect to it. At the moment it is about water-to-food if you consider the fact that it tends to occur in soils that don't retain a lot of water – so for instance with carrots, we grow them in sandier soil and so the rainfall will leach the nitrates from the soil, well that is the theory behind it, and the work will be about sharing knowledge amongst growers and their farming practices towards it.

END OF TRANSCRIPT

Interview with a CSR person at a top retail company in the UK

So my role at [top retail company] is that I sit within the sourcing, and the buying team, and I am looking at all the sustainability related issues, topics and issues that would hit our supply chain, and basically supporting the business by setting strategy and helping to embed that in our buying processes. But also looking beyond that, looking at who we need and what the best approach is to tackle some of these issues. So I do a lot of work externally, working with other organisations, working pre-competitively with some of our competitors on some of these things, so ultimately securing the supply chain and making sure that it is resilient. That is primarily my role.

Interesting that you work together with your competitors around sustainability issues...

Absolutely, so, very often these issues are bigger than what one business can address alone. Yes there will be times when we want to make moves, and where we are able to affect change, but often the most effective way of working would be to work at an industry level. There are quite a few industry level groups. We discuss things. Recently, for example, we have set our sustainable soy policy, which is a huge feed source for a lot of our meat products. And to do that we have developed our policy as [top retail company], but we are also working for an industry round table group, that's aligning the UK sector on what it is we are trying to achieve. So if you are a supplier within that system you are getting the same market signal from your retail in the direction.

Does the round table have a specific name? Or is it informal?

So this is the UK Roundtable on XXX And it is actually being funded by the UK Government, because they have a political will to progress the UK activity on sustainable soy, and particularly in connection with zero deforestation targets which the government signed up to through the Amsterdam Declaration. A good system wide example. A lot of actors are coming together. And if we want to create some kind of change in this hugely complex supply chain, we are essentially looking at traded commodities, we have to have a strong enough UK... I mean arguably the UK isn't strong enough to get Europe together to demand system change, but at least at the UK and company level there is.

I noticed from your sustainability framework, from your website, that you touch on numerous topics, such as animal welfare, human rights, and environment in a more broad sense. Is there anything amongst those areas that have a water angle?

So yes, this is something that I wanted to talk with you about. Because I would say that on the environmental front we are at the start of our strategy here. So we've got, as a function of sustainability within [top retail company], we are relatively new, we have had it in place for two-two and half years, and we have spent those years getting our thinking aligned, and getting our base lines in place, and now we are pushing forward with the programmes we have identified as key areas. And so getting a very clear climate strategy in place for next year is one of our strategies as a team. Within that I see setting carbon reduction goals, working within our fresh produce supplier base, and other supply chains, looking at we need to do in terms of soil health, biodiversity and water stewardship, all those kind of things, so we can actually set some clear targets that we can get behind and that our supply base can get behind as well.

Can you say a little about how targets are set, and how to measure them? Where does the knowledge come from to do it in the first place, and then what kind of activities are involved in agreeing what the outcomes should be?

It really does depend on a topic by topic basis, but there are some general principles that we would follow when we are setting a new commitment or new focus areas. So as a CSR sustainability function, we would be the one identifying the issues, are what the business will need to be working on, and that would be done using our own knowledge and expertise, but also understand what are the needs, what is science telling us, what reports are coming out, what is on the government's agenda, we are the expectations and requirements that will be built in... So for example, in the Human Rights side, the Modern Slavery movement, we were campaigning for that before it was introduced into legislation. We will also be benchmarking against our competitors, understanding what else the market is doing. Talk closely with customers, trying to understand what is important to them, what they are looking for when they shop with us. A recent example would be plastic and packaging which has risen up the agenda – it is so important to customers now. That has really driven a lot of our activities as well. Part of my role is to also engage closely with the key NGOs and understand what is on their agenda, what they are going to be asking for or campaigning against.

So WWF, Greenpeace, Oxfam, RSPCA – they have all got their... – recently they have taken a more hard line approach – sometimes they are more collaborative, but recently there has been a lot more benchmarks and rankings, and things like that – and they are taking a bit more of a name and shame type of approach, which of course has its pros and cons, but it is one way for them to drive a campaign.

So we do all that kind of strategic thinking and come to a point where we have a rough idea of what we want to progress on and then we will then, if it is a supply chain related thing, I will generally go and talk to the key suppliers who will be affected by the policy change. And in fruit and veg we have very strong relationships with suppliers, as a business we have been quite small in the past, but in the last 5-10 years we have really grown in terms of market share so we have a lot of suppliers who were with us in the early days when we were much smaller and have grown with us and we can have these kind of conversations, and we can get their views because that are the experts dealing with it on a day-to-day basis – so getting their views, understanding what they are doing for other customers, understand what would be helpful – we don't want to do things for the sake of it – we always want to do things that are going to support our supply base and help drive change. So we will get that feedback and think about what targets we want to set – we'll get our buyers involved, hear what is feasible from their perspective. Obviously, we are a commercial business, we have to take that in mind, understand the supplier dynamics, particularly in fruit and veg, which is so affected by climate, we have to work within that, we can't do anything that is unrealistic.

Did the dry summer this year affect the ways you interacted with your supply base?

So our buying team was having daily calls with the suppliers, on what is going on, what is availability looking like, where there are supply challenges and they will be constantly making decisions based on that. As a retailer, I would say that our specifications are much more relaxed than other retailers – so for example we don't promote the idea of wonky veg – because we think that by making a separate market for it you are saying that this wonky veg can't be used as a main stream veg, so we I'd say, our specifications absorb a lot of stuff that other retailers will call wonky veg. So we've got a mechanism through that where we can be more open in terms of what we can accept.

But over the summer there were a few issues, say for example regarding skin defects on potatoes, size requirements for celery, lettuce, white cabbage – but the buyers would talk to the suppliers about what they could do. And this year there was also an issue with pears – they weren't growing to the full size, this was a climate issue, so we couldn't sell them as a class 1 pear, so instead of rejecting them, we put them into our XXXX range, and you know we can be quite creative about different ways to get things into the market...

I: One thing that we have been thinking about is how water-waste is embedded in food waste. I am interested in how the idea comes about to repurpose fruit to be sold as opposed to being wasted – how does it get put into action?

We are quite a lean business, we are a [xx], and we do things quite differently compared to some of the more mainstream established retailers, so we can be quite dynamic. And our buyers are quite switched on to finding alternative opportunities – so we can always trial things, there is a lot of creativity within the business – so the idea might come from one team and is fed into the buying team – or it might come from the buying team themselves, because obviously it is a commercial business, and there is a commercial gain, so if you are rejecting crops from a supplier to whom you have a contract with – that cost will obviously be absorbed somewhere else in the contract – so if we can take it and can sell it – then that makes sense for everyone in our supply chain. But we are really switched onto the idea of impact and the result, the amount of energy and water that is needed to produce, the environmental cost of the products we sell – and we have had quite a lot of debate with NGOs regarding the plastic packaging discussion that has been going on at the moment – there is such drive to get rid of packaging, to sell stuff loose and we have been pushing back – it is really there for a reason – there is some packaging that we can get rid of, avoidable stuff out there- and we should be reducing that – but the goal shouldn't be to get rid of plastic all together because it plays such an important role in protecting food and reducing food waste. And if we get rid of it, the system level impact will be greater, if we go down this route if we get rid of plastics...

What has the outcome been from those types of discussions?

We have done our research on it, when we were developing our plastics and packaging strategy – and there are a number of other retailers who have made bold statements and commitments about getting rid of plastics, and then people were looking at us and asking what we are going to do.

So we took the time to stand back, we did a full audit of our packaging footprint, looked where the opportunities were, took an evidence based approach to what we should be doing, the right thing to do – and stretching ourselves to make sure we are drivers of change.

So we felt comfortable in our strategy, the right one for our business.

But NGOs have completely different perspectives, Greenpeace for example, ranked us against the other retailers, they want to eliminate plastics and no amount of debating is really going to change their views, so it's more just a difference of opinion, while we are trying to be very clear on our position, and trying to build our communication on-line, and everything like that, so if we are challenged, we can say fine, but we do have a strategy we are doing stuff...

Can you think of anything else that might further exacerbate water-risks in the fruit and veg system?

So we are doing a few different things about minimising food waste, in our supply system, in our stores, and in the homes of our customers – advising them through packaging as to whether they should be keeping products in the fridge or out on a shelf or in a bag, and so on. So we recognise that food waste happens at each level of the supply chain.

Other risks, what we will need to consider more connected to water scarcity is how we work at an industry level on this topic. There are a few programs linked to the courtauld project, with rivers trust, WWF, and catchment approaches – taking a larger catchment approach.

So we have been discussing, looking to the WWF water risk mapping tool, which you can see in terms of UK and globally, the regions that are at risk, and that is really the start of the strategy, and what I

hope to do next year is to understand it better, understand exactly where our suppliers sit in those regions and where the risks might be, and if we want to participate in a programme, work out where we can demonstrate the most impact.

Can you say a little more about how the demonstration of impact works? Is it communication with customers, how do you measure it, and where does the information go?

SO there are a range of ways to go about it, there are a number of complex high pressure supply chains – and I think there is a risk that you can spend too much time to gather too much information, and reporting everything, although it is important that you are able to track progress, so we tend to take it on a case by case basis.

With seafood for example, we have committed to 100% MSC certified wild and caught products, which is built into our tender process, so that any supplier knows it is a minimum requirement, and we will do an audit on an annual basis, and the suppliers know that they need to have the data available, and we will check against it.

If I can imagine what a water catchment management approach would look like, that would be at a high level tracking progress and if you are working with a third party, or an expert partner, that would be part of your contract going into the program, and determining how you are going to assess and provide updates, quarterly, or half yearly, if we were setting targets for suppliers, we would build into the commercial agreement with the supplier, as a part of our relationship. The more you can build these things into your way of working commercially, it will make it easier for everyone involved.

Is it straight forward? Or are there challenges involved in establishing groups to share risks?

As a business, at board level, we have very strong support for sustainability and CSR, so much so that it is in the core of our business plan going forward, so we have a strong leadership, and we see sustainability as part of our growth moving forward. So in terms of senior buy-in I think we are in a good position, which is great, within that then, it is for us as sustainability specialists to identify the issues that we need to address to make sure that we are developing the best approach for our business to make sure that we are doing the right thing for our business.

With water as an issue, I am aware that we need to be doing something and we need to strengthen – at the moment we work with a lot of standards, so all of our fruit and veg is red tractor assured, and as a minimum we would work with red tractor to make sure that their requirements include something about water, as a minimum, but in order to take it to the next level, which would involve some investment from the business into a programme I need to make sure it is going to be the right one, and not just putting money into a project – and in this case you are generally not as engaged so that's what I will be thinking about next year.

Is there any risk associated with a sudden change in organisational structure or business plan, so say all of the hard work that you are doing, is it going to hold even if the leadership changes or decides...

That is always a risk, and for [top retail company] as such a [xx] business, I am the only one doing this role, playing this function within the business, so for me everything I do has to be embedded in the business and part of the other teams and how they do business. If I were to go, or if there was a change, what would be lost – the strategic thinking about – what next, and what should we be focusing on, the external engagement, attending certain events and so on, but everything that we have built up until now is in place to be embedded in other teams – I think this is the priority – if you are holding on to too much as a sustainability person you are not effectively driving change within your

organisation – this means that you have to work a bit harder to get things embedded, but then you have longevity, you have a much better chance of keeping things going.

For [top retail company], not only in the UK but internationally, it is so rooted in the company DNA, I think it transcends individual people, or team structures. We are one market out of thirty, and in Europe we are the [xx] retailer, and we can use our leverage on certain issues, and I think that we are a young dynamic business, and I think that a lot of people that work here are very engaged on these issues. And also, I think it is a license to operate. Moving forward, if you are not moving forward on some of these issues, you are going to be impacted in one way or another, because it is more important to customers, and we are getting more and more challenged from external organisations, and when it comes to reputation, we can't afford to be slipping behind.

From a sustainability perspective, the most recent climate reports, we know that there are issues with the future of farming and young people coming into farming, and all these things – modern slavery connected to current migration patterns. Unless you are on top of these things, And if we are driving these things, it will ultimately affect your ability to operate as a business successfully.

Interview with Manager – English Apples and Pears Growers (Producer Group)

S: Just to put my work into context, ok, so I am General Manager of a cooperative of 21 growers, I am chairman of the XXXX and I also work for English Apples and Pears which is the overarching organisation for all growers. I have something of a death wish having three jobs that concentrate in October – it's a bit mad really.

G: Are you based in Lincolnshire?

S: No our offices are based in Kent; my office is based in the heart of the growing region in Kent.

G: So lots of driving and travelling for you nonetheless?

S: Yeah, I just clocked 35,000 miles in the last five months.

G: Wow, so very busy then...

S: Trust me; I wouldn't have it any other way. It's mad, but it is always interesting.

Recording officially starts.

So what do we need to ensure a secure supply of fresh fruit and vegetables? Well we need BREXIT to go away. The challenge is multi-layered. So, because we don't have a migration strategy, we don't have an immigration policy, we don't know what is going to happen with our work force after March 29. And so, it is really hard for us to encourage our workers to come. Because we voted, by a narrow (a very very narrow) majority to leave the EU it also means that our currency is de-valued, so we have gone from being one of the best payers in Europe to one of the poorest (middle range) payers.

We have an economy that is very dependent on migrant labour – (I have been talking a lot about this lately so I tend to go on a bit) - we've got 60,000 people needed in horticulture every year. 30,000 are registered in the UK now, and 30,000 come in every year. Of that, they are predominantly Bulgarian and Romanian, and there is only 1% British. And so, our big challenge is, that we have a government that has been hugely successful in having the lowest unemployment rate in my lifetime (and I am old) and our message is that we don't have any people we can approach and generate interest from our local communities. You can't have stay at home mums because they can't bring their children. You can't have people receiving a benefit or disability benefit because they will lose their benefit for taking a temporary job. We can't use prisoners because they won't care and you can't have people picking fruit who don't care. And we now have a quality that says we don't want people... if we go for the Chequers, or for the Norway we will be restricted in how many people will be coming in from the EU and we will stop dead... We as an industry cannot replace the people that come and work for us every year.

And there is lots of chat about technology, lots of chat about robotics – it's bloody, it's not in their lifetime that will happen, because unless we can create a tree that stands up perfectly straight in neat rows and where the fruit only grows on the outside – a robot on a track won't be able to pick them – we need people. And we don't have enough people in the UK.

Sorry. Rant over.

G: No that's perfectly fine, and certainly BREXIT has echoed loudly amongst the people we have spoken to through the project...

S: It is hell. We already had countries, countries like Poland, Estonia, Latvia that we had been drawing people from, historically, and had been much easier, but their economies have recovered

and their levels of unemployment are lower, and so it has become less attractive to travel such a long way.

I used to work with people who would come over and pick fruit for five years, they would own a farm back home, they would have built a house, and the Polish economy is thriving because those guys came over to work and they have really helped the British industry. We don't have comparable generation of our own here in the UK.

G: Do you think that this will ultimately result in a larger amount of import into the UK?

S: It is double edge sword. When you close the borders – we won't have those workers coming in, and we will all stop. The country-side will become derelict (that's not a hysterical statement) every year 60,000 people are employed by horticulture and we will all stop because we cannot pick our crops and so there is no point in growing it. We will stop home production because we won't have any people. And if we go for a Canada, or a Chequers deal, people can bring whatever the bloody hell they like in because there will be no control – you can have your irradiated tomatoes – you can have apples that have been waxed – products that at the moment we protect our consumers from. If you go to practically any other country outside of Europe they have an arsenal of chemical treatments in order for produce to last longer to be more, or whatever - which we don't use in the UK for pretty good reasons. But actually BREXIT could actually bring a quite heavy chemical load into our diets.

G: Ok, so less chemicals?

S: Yes. We are hugely regulated in the UK. Not only do we have restrictions on what our acceptable residue levels are, we also have our own CRD [Chemicals Regulation Division], and because we have to have controls and approvals that are specific to the UK, there are even fewer products. If you look at hops, if you are German hops grower, there are up to 37 products you can use, there are only 11 in the UK.

G: We have been talking to many different parts of the supply chain including agro-chemical suppliers who suggest that resilience is embedded in the use of chemical treatments, do you think that there would be feedbacks or trade-offs by using less chemicals? Do you have any thoughts on how the use of chemicals re-arranges water use, fruit growing and working towards a future of fruit that is cleaner?

S: Do you farm? Do you have any experience growing commercial crops?

G: No.

S: The real challenge in this one... well you talk about crops being cleaner... so would you differentiate between commercially grown crops and organic? Would you say that organic is cleaner?

G: No no, sorry. I'm not trying to take any specific position, I am echoing what other parts of the system have been saying so that we might be able to map out how differently, different parts of the system can think.

S: Ah ok, well there is always good and bad stuff around you. Have you heard of any body using Integrated Pest Management?

G: Yes. I have heard of it through some of the organic or LEAF accredited stakeholders who use it.

S: No it is not. No. Integrated Pest Management does not belong in the organic sector...

G: Ok, I'm sorry, I think I have miss understood something... I thought you were talking about the use of certain types of plants that invite and encourage insects that are help control other insect pests such as aphids?

S: That is not an organic practice. Integrated Pest Management is part of a cross industry strategy across all crops. It is not an organic practice.

G: Ah, ok, then I have definitely misunderstood something.

S: Right. So, no one can afford to use any form of chemical if they don't need to. It is too expensive. The margins on producing crops in the UK are so small, that you would be really stupid to use something that you didn't have to use.

Everything that we have in our arsenal in the UK has been tested, tested and tested again four more times by the CRD (We as growers pay for) to make sure that is doesn't have a negative impact on the environment, any negative impact on our consumers and that there is no residue left when it gets to the plate.

Because we have specific, targeted products, that don't build up resistance, and because we are investing in things such as irrigation systems and soil management including micro soil analysis strategies we are reducing our impact year after year, reducing our carbon input/footprint.

One of the things that clearly winds me up, is the summation that organic is better than anything else.

I live in the middle of an organic farm, and they are out on their tractors for upwards of 30 hours a week, spraying, there is no evidence of IPM out there, and they spray and spray and spray with tractors that run on red diesel and chuck out smoke 30 hours a week. And I am really horrified.

I have no experience with organic farming. I did a module on it during my degree, on how organic works in principle. But the practical example I have at the bottom of my garden horrifies me. My guys are in the orchard for 2 hours every 14 days, and yet they are there for 30 hours in 7 days.

It is one of the real big challenges we have got, if look at the competition document from DEFRA, apart from the fact that it didn't mention food, and there is so much in there about green and you've got the RPA talk about organic, organic, and if you look at the carbon loading and what they use at the other end of farming productivity is farm higher than in the organic system... productivity is hardly comparable. I have a 20 year old orchard, the one I have at the bottom of my garden that is cropping somewhere around 20 tonnes per hectare compared to orchards in my group that produce 45 tonnes per hectare.

G: Certainly, and what you have been saying has not been uncommon among other stakeholders that we have been engaged. So for example, the way that *we (including myself)*, as consumers, get told about what is right or rather what is best, perhaps corrupts the idea of how things actually work.

S: Absolutely, if we go back to the basic premise that it all has to be British... if we are going to produce food for our nation we have got to seriously up production. We are self-sufficient up until the second week of August, if we only eat food at the current volume per capita until August. (In terms of apples and pears we are 46% self sufficient. Not including processed apples.)

G: Do you think that the BREXIT issue and other issues surrounding chemical treatments as you mentioned, are compounding water risk, response to drought, how abstraction licenses are distributed, and our ability or inability to think about climate change going forward?

S: It is difficult because water issues are not the deciding factor anybody's business plan for top fruit, it just isn't. For farms, if they need to irrigate, they definitely don't use mains water, the margin is too small, it isn't dependent on drawing down water. Most sites have got either a borehole or they are capturing water in irrigation lakes.

G: Did these strategies help during the dry summer this year?

S: Yes, they did help immensely. Those that didn't have irrigation will likely have a light crop next year because the trees would have been stressed, but in terms of main picked volume it hasn't really made a difference.

We had a good long cold winter, which actually helped to keep everything dormant which helped to harmonise mineral balances and equalised ripening and so we have quite a substantial crop. It is not as much as we thought it would be, but it is certainly a good quality crop.

G: What is the most desirable outcome for the top fruit industry going forward?

S: We need a workforce. We have absolutely no hope of recruiting all the people we need from the UK.

The unemployment rate has been the lowest at 3% about 1.2 million people, basically full employment. And those who are unemployed - there are the likes of my brother who is handicapped, he is on a disability living allowance and who won't ever be able to work and there are something like 600,000 like him. They are not available to work. And you have got lots of people for many very very good reasons who are unable to work because of mental health issues and all the rest of it. That 3% of the population is not going to yield the 60,000 we are going to need, let alone the 80,000 we are going to need by 2025. It is our access to labour which is crucial. And after that comes support and resilience, because at the minute if we don't have access to labour, we will see the end of a lot of our business and this will have a severe emotional impact on the custodians of 5, 6, 7 generation farms.

I'm 6th Generation, in my family business, in my group of growers, I only have 2 first generation growers, most of them 3rd 4th or 5th, even 9th generation growers.

G: is there a challenge in encouraging new farmers into the industry?

S: There are lots of programmes, and a focused careers service directing people towards the fresh produce industry, but we have an enormous challenge, because we have educated the previous generations (X and Y) to believe that they are better than manual labour and with the perception that farming is manual labour.

When I give presentations at a school, I never get the whole school... I get those awkward, difficult, clumsy kids, the ones that people don't know what to do with – because if you are too thick to do anything else you should do farming. But we need graduates, we need highly qualified, really skilled, bright people – technology is driving farming.

G: At the beginning you also mentioned that it is really important that you have people that care about what they are doing.

S: It is a hugely emotional job. I cannot begin to imagine what it is going to be like for these guys if we do not get a deal – and we are likely not going to get a deal because the mechanisms to get the thing approved – it's not going to happen. It's not going to happen this week it's not going to happen by the 17th of November. If it has to get approved by our government it God help us – no chance – it will have to be approved by the European Parliament, and they are looking at Greece, Spain and Italy – and Holland – all of whom have made known their intention to examine article 50 and BREXIT – and they have to make it so damn unattractive the no one else is going to want to do it. I think we will go to no deal, and we will fall over that precipice, and we will have issues getting produce in and out of this country, people in and out of the country, we won't be able to get a workforce in here.

All the strategy around closing the M26 at night because they are preparing that with a great big storage unit and you drive down the M20 with rest stops for the growers and all the areas that have been repurchased for lorry parks... *[referring to Operation Brock? – a no-deal BREXIT action implemented to manage perishable goods and stranded lorry drivers that will be unable to proceed any further into the country, caught up in processing documentation, etc. as a result of post-BREXIT conditions for the flow of goods – highlighting the lack of BREXIT strategy and planning?]*.

I was meant to have the whole RPA and DEFRA horticulture people on site last week and they were told that they weren't allowed to travel, because all this week and all of last week they have been in emergency planning sessions for a directorate for what should happen if there is a no deal.

G: Are you and your teams also undertaking similar planning sessions?

S: It is very difficult to plan because all the inputs for all our trees, orders and all that stuff will be in before the 29th of March, and everything that we can do to move stuff in and out of the country will have been done prior to the 29th of March.

But, the nasty bit, that I have to go and do tomorrow is to talk about how we manage growers psychologically, when we have to tell them to walk away from their businesses when at the end of March they don't have any labour. We have to tell them to not grow their crops.

G: I understand it is incredibly important aspect is to manage the psychological impacts... I grew up in Australia in a region that was prone to drought...

S: Oh yes I was in Victoria, and the Merino farmers having to make awful decisions... and I look at my farmers and they put their heart and soul, and their entire life, they are responsible for the workers there, and the work of their great grandfathers.

And the work they do pruning, mixed hedging, inviting all sorts of birds, and strategies for insects and they will tell you all about the different types of bees and the projects they have been involved in about pollination and they now know about the 22 different species and grass that grows between the trees and how this helps the different types of bees... and their environmental strategies... they work so hard, and they love what they do so much and I have to be the one to tell them not to do it...

It's so difficult, I am a 6th Generation grower, you know and I am going to have to go and manage my land and who are also my family, I have three relatives involved, and will have to my best to help them cope.

We are going to lose people. Mental health is enough of an issue in farming, there is so much emotional investment, and the responsibilities that lie on them so heavily.

G: Do you get any support from the rest of the industry?

S: No. there is so much of a push that says that food has to be cheap. They are under huge pressure to meet a social agenda they are under pressure from government to increase the number of vegetables consumed and the only way that can happen is by making it cheaper than anything else – which shows that it has no value, and as a product we see growers being de-valued. All the talk about supporting British farmers is absolutely rubbish.

Interview with a fruit producer association

P: Well one of the things I do is work for [a large fruit producer company in the UK]. It is a family business, but it is spread throughout the country. It is up in the North East and all around the UK.

And I also help to run the [fruit producer association]. So it is about 200 ha of glass house grown [fruit] in the UK, commercial [fruit]es, which are largely destined for supermarket shelves. But people also do niche and artisan products, and so it's not just the big retailers that take British [fruit]. There's both conventional and organic [fruit]. About 5% of [fruit] grown under glass are grown organically. Here at the [South of England] there are about 7 ha of the 27 ha that are grown [South of England]

So yeah, my own specialities if you like are organic production, soil plant biomes, leading into human biome stuff. So there is lots of stuff around what seems to be fairly discrete jobs and where they intersect.

Also, within the [fruit producer association in the UK], I am on a committee called the Technical Committee, as you might expect it is called, and that is a group of growers and other experts, there are 12 or 14 of us sometimes, who sit and discuss and steer on behalf of the industry issues like water, like energy, like pesticide use, and the policy side of things with DEFRA. – So it is an overarching and broad remit, if you like.

G: Was your team responsible for the [xxx] document on the [fruit producer association in the UK] website?

P: Yes that is the core document of the committee, that one alone is quite generic, but what we have as well as that is a document like a RISK Register, so we look at all the aspects of our R&D priorities from pests and disease, to labour, to energy, and try to classify each of the issues around each of those items, in terms of risk. So you know, High-Medium-Low, what are we going to do, what is the impact, what is the risk if it came to pass, the usual risk register kind of things.

And water has been a big topic over the last couple of years with the Water Directive and the requirement that all growers inside glass houses to have trickle irrigation licenses – and this is all part of the water abstraction policy reform – which we have been a part of and I must say that [xx] the NFU has been very helpful in being our advocate with DEFRA as far as that goes.

One of the big concerns within protected crops is that irrigation is pin point applied, so obviously the central tank, where the nutrients is not an organic product, is stored and mixed, and then that is delivered to Rockwool or another substrate maybe Koya slabs, and it is very accurately and closely measured as far as possible to the requirements of the plants, no more, no less. And, that requires constant application almost, particularly on a hot summer's day, where the slabs don't have a big buffer capacity, so it is necessary to continually water. Whereas, when the abstraction policy reform conversation reform came out – *and we thought we were special* – it's not like arable, where you water and where the plants can search for water, where water isn't applied topically. And, I remember sitting with the permanent secretary at that time, to [xx] – who was the water minister and – it was [xx], this chap, and he said, "Well, you know what, everyone says they are special – everyone that comes to talk to me says that they are a special case".

And it almost felt like part of that overarching issue with the government and those people within government both policy makers and politicians and civil servants. That because we are physically small, 200ha is so small, not even worth thinking about, more of an irritation than a benefit if you like. But proportionally that 200 ha produces probably about 10 times the quantity of food if you like. It is highly efficient, it uses water thoughtfully and it recirculates where possible, where the brewery has that infrastructure, it treats run off very carefully. More often than not, the runoff will be run through reed beds to be purified before it is discharged into a water course or it would be recirculated. So water has always been very thoughtfully used in protected horticulture, especially in [fruit] growing, and I think that is also the same for cucumber and apple growers who are very thoughtful and much more than arable for instance, very conscious and treat every drop with respect.

Is that because the [fruit] is particularly sensitive to the amount of water and nutrients it gets?

Fruit quality is affected by the amount of water the plant gets, as in terms of overall quality, and also in terms of the organoleptic qualities, as well as overall plant health, healthy plants get less problems with pests and disease. It's about maintaining plant health and giving the plant exactly what it needs – no more no less.

You inspired me to think about what it is about the [fruit] growing industry that encourages that particular level of care that might not necessarily be the case for other sectors.

Well, I think overall it is a culture within protected growing, because it is a very technically challenging way of growing. For instance, you have a background of pests all the time and the occasional disease, but the first thing a grower would reach for would be control – so they would introduce predators for the pests and that takes a lot of thought, and a lot of knowledge, to get that right, to develop that ecosystem, in his or her growing system. So that is a thoughtful approach to growing without pesticides. And then you have the cost of the infrastructure, a hectare of glass costs, probably a million pounds and if you have LEDs in that structure it probably cost another 1.2 million pounds. So getting a return on investment requires the highest level of skill from that grower, to be economically sustainable. And that just quite naturally flows into every input such as fertilisers which are incredibly expensive, the industry has developed recipes and ways of minimising inputs in that sense and water is also a part of that whole system, water is also thoughtfully used. Where possible, some growers use recirculating systems, some growers don't, some growers use no substrate at all, so using a constant recirculating nutrient film technique where water just goes round and round the system adding more nutrients, adding more nutrients when plants use up the nutrients, and adding water as plants take up the water.

So it is really part of the culture to think a lot about what you do and use, and if you didn't you probably wouldn't be in business. And that also extends to things like energy and energy sources and how you use that, how you use the waste, heat from electricity production which is now the main say of 90% of [fruit] growing in the UK, how we use the by-products from that, the heat and the CO₂, how do you get the plants to take up as much of that CO₂ that as put into the glass house – so it is just a part of the culture.

Do you think that with a highly efficient system of growing, would you say that this approach is a resilient approach?

I think that as long as there is water we can grow. The issue is really with abstraction policy reform. Although it is initially going to be an issue for abstraction from surface water i.e. rivers and streams. Growers rarely use mains water, so they use groundwater, boreholes, and if it came to a time when

the EA restricted for various times of the year, particularly down south east, so I am think about the [South of England] sites, with an increasing population, which are obviously priority for water demand in any situation. The horticulture then got restricted, there was one summer where there was effectively a hosepipe ban, and growers couldn't use, or couldn't abstract water then that would be the end of the business. There is no buffer capacity more than a day's worth in a tank. That being said, here on the [South of England], we do have reservoirs, about 100 million litres of reservoir water which is captured from roof tops, more commonly, growers don't have the specific space to install a reservoir. So in that case, there is always the potential to link up with a local farmer and dig out a gravel pit which can be turned into a reservoir fed by glass house roof water. So it is about being as creative as possible.

We do have, obviously in the UK, a reasonable amount of rain water at various times of the year. So thinking about the best ways to capture water. It is really difficult to think about, based on the current paradigm, how you can be much better. If we could all recirculate that would be fantastic, but again, the technologies aren't quite there yet, and growers are quite confident in recirculation, so that could do with some development.

Policy risk, policy makers do not understand you have different requirements and should be approached in a different way.

Are there any concerns through the use of recirculation? From retailers that have limits of uptake? Is it the slow burn of ag that limits the uptake of tech.

Of all the sectors that I could think of, [fruit]are unique because there are a huge amount of innovators in its team, we are fairly early adopters of new technologies, it is the cutting edge and bench mark, certainly outdoor and arable could learn. In many aspects of what we do.

I think that the 1000s of ha of arable land in the UK, most of which are currently eligible for CAP payments – the XXXX gets nothing from Europe, nothing from the CHP, it is completely self-sustaining, it doesn't get involved with that big voice stuff, and doesn't lobby the government in the same way, it's not about large landowners. Frankly, it is difficult to deny that the big landowners and vested interests are in one way the masters' of the universe, they have the political power to, they own the land, they press the agendas with the government, they are benefit takers. We can talk often about having a spare bedroom, but these guys take huge amounts of benefits. EU benefits and after Brexit, UK benefits. And they are a strong group of lobbyists in that regard. And are established with the policy makers, have a lot of clout and lots of influence, and lots of capital too. Where as we tend to be smaller, so 200 ha is nothing is it, in the large scale of things, most people who didn't know what that meant would say well that is absolutely nothing is it... but the inputs and the risks the growers take, the innovation that is coming out of protected growing, it is just extraordinary. And by far trumps what any other sector is doing. I think that to educate those who are making policy, getting them out of their offices is the first big difficulty. When we have had shadow secretaries and shadow members of state, who seem to be more proactive, than the Michael Goves of the world... The problem with politics and the problem with politicians is that Mr. Gove might be there today, but he might be somewhere else tomorrow. So there is no consistency of policy. Other than the civil servants, and talking to Henry Levenson Gower, I can see that even he doesn't understand, even after all his years in that position so...

I recently had a conversation that touched upon this topic... How do you make sure that horticulture and particular protected horticulture has a loud voice even though you are so small and it is just about chipping away and educating people and showing them what the potentials are not just now

but also in the future. There is lots of interest in vertical farming in big sheds with LEDs and layers of crops such as microsalads, and that directly leads on from the technologies developed in glass houses over the last 50 years but more recently in the last 20 years where it has really taken off. And with that attracting huge amounts of investment, from venture capitalists and pensions schemes getting involved in vertical farming projects. And what is happening in the glass house is evolving too, so this is scientific growth if you like, but it uses resources highly efficiently and it uses it thoughtfully, it is progressive and it is always moving forward, it hasn't stopped since the 1950's. These 200ha are always 200ha of experimental facilities if you like, that's how it is in glass houses.

It is really hard to know how to properly educate the policy makers where they don't seem to want to be educated, and just stick with the status quo. Until the policy makers want to change, or are in some way enlightened. And again as Gower says, everyone says we are special – but really we are special.

What about the [fruit] Conference – is that a platform for knowledge dissemination and raising awareness?

The [fruit] conference is outward looking as possible. This year we had the president of the NFU, Mr Gove, but couldn't make it. But she made it and shares a platform with Gove quite a lot and she is quite political and actually quite critical of the politics we have in the UK and its lack of thoughtfulness and that the politicians are quite inward looking at the moment, looking at their own careers and how I can move things forward in the UK, and I guess ultimately further my own interests in my world.

What we are trying to do is get young people involved in growing and in horticulture. Where horticulture has always been seen by teachers in schools as something that you do when you have special needs – and even that is educating the educators. Here in [South of England], we're giving over a period of 20 years every school on the [South of England] a glass house, for primary schools for about 10000 each, so they are not the b and q jobs... but I am noticing here on the island that even the teachers have come through a system that has led them to think that this is something you do if you have special needs... get out in the school garden you know.

But it is highly technical, and it has so many aspects from marketing to HR to zoology, entomology, energy, engineering, policy, it has everything within the curriculum that you can think of- so the first thing is to educate the educators.

And to educate the policy-makers...

Having worked in my past life together with the Soil Association – it is a group of young people with lots of fantastic ideas, and who don't always get it right, but they are really pushing for a vision that they have for a world that they will inherit long after the policy makers are not around.

The policy makers tend to be in the over 50s and 60s and who really haven't got a big issue with the future – and the policy should be developed 20, 30, 40 somethings – because that is where the energy is and that is where the vision is- because what is going to be around in 20 years time is not what we have got now- and what we will have in 50 years time is certainly not going to be what we have now. So with that vision and with the responsibility for the future, policy needs to wake up and needs to be inhabited by people who do have energy and vision – and I suggest that that is not necessarily what we always have at the moment.

This afternoon I have a meeting to do with Urban Horticulture it is a DEFRA request for us to scope out the possibilities for a more general urban horticulture system which might be economically

robust, and in this future that we are talking about where the big super markets aren't so powerful and things are more likely consumed, locally produced locally consumed, it's thinking about the future to base a policy around... what will the future look like how can we get people more engaged with where their food is produced and be more part of it than I buy it from tescos or sainsburys they actually know that down the road there is where their food comes from and they have an interest in knowing where it comes from – as is the fact with a lot of the middle class now like to know where their food comes from they shop in farmers markets and that can be democratised and that we all can know where where our food is produced and that we all have thoughts about it, and that it is important, that it is robust, that it is sustainably produced and that it is what we want, the right quality and that it doesn't have any pesticides on it – and even some days we go and help to produce our food – where food becomes more central, not just in terms cooking but in terms of protection and this has spin offs in terms of both knowing where your food comes from, knowing it is of good quality, but also in terms of mental health- that people are disconnected from their world and live in boxes in front of tvs or computers and ipads and whatever- it's about reengaging with who we are as a nation, who we are as individuals as well – food is centrally important to everything we do, and I think we will hear more and more about that.

And with the upsurge of veganism and vegetarianism is a big worry for the meat producers and the dairy sector – and they will do everything they can to quash this new movement among young people - because if it continues, in 30 years time their business will be decimated – it is a bit like the oil industry – you can imagine how worried they are – it is a concern – I think there is a lot going on – the next 30 years will be revolutionary – and we will end up in a new paradigm and hopefully that paradigm will be somewhere else- more progressive and thoughtful and more human...

What we are learning at the moment is what the implications for your gut biome is, it is thought that your microbiome controls - the upsurge in non communicable diseases, probably since the end of ww2 – 1940s 50s - has mirrored almost extraordinarily closely the upsurge the use of pesticides and antibiotics as wonderful as they are we have used them rather thoughtlessly and that our biome is who we are- of your total genetics- only 1% of your total genome is human 99% is microbial of you physically cells, only 40% are human cells the other 60% are non-human – it is so interesting – it about plants, and soil and human health – finally we have found a link between human health, the upsurge in cancers, allergies, diabetes can all be traced back to a disrupted micro biome – it is absolutely revolutionary – and it is not widely known at the moment – this is the kind of stuff that makes me think this is so exciting – maybe the future is going to be fantastic.

It has the potential to rearrange what is at stake – how we plan things out, how it shapes who we are in so many different ways

Interview with Fresh fruit and vegetable processor

Would you mind telling me a little about the fruit and vegetables you process?

So we are processors of ready to eat salad bags, we aren't growers in our own right, although we do have some joint ventures, we don't grow anything ourselves – we just process salads that become ready to eat bags.

Where do you source the salads from?

In the summer, it is all over the UK and in the winter, it is from Spain and Italy mostly.

We are actually owned by French growers, so we also get a lot of our product from France.

And so you have a very direct contact with the growers?

Yes.

Do you also buy from the market as such?

No no we program all our produce, crop requirements.

And who do you sell to?

So it is a bit split, we have three salad factories and a beetroot factory in the UK, the biggest of which does the Florette brand and they sell to every retailer apart from M&S. We then do, at another site, we do 80% of Co-op and all of SPAR ready to eat bags and bowls, and then we do quite a lot for the sandwich manufacturers, which then ends up as retailer sandwiches. And then we do the likes of Subway and Greggs, so quick serve restaurants.

Washed salads, cucumbers, peppers, tomatoes... it's all ready to eat – high care ready to eat products, cut and prepped.

Which of these customers would you say you are most dependent on?

We are most dependent on our growers – we can't do anything if we don't have any crops – a bit like this summer... we had a challenging summer.

Did you run out of salad at any point?

Our service level was generally pretty good, but we had to procure from outside of the UK, including from America – we flew some iceberg in from America.

And this is quite unusual?

It is in the summer yeah, it's pretty unusual but has been known to happen in the winter.

Would you say that drought is one of the main water risks for you then?

Water is quite high on our radar, not only for quantity but also quality. Micro risk in leaves is quite high so we need clean water and also the salinity of water is important. In Spain, for example, they use desalination and water from the sea but it isn't very good there is still a lot of salt in the water – so you have to mix that with better quality water – but if that isn't done correctly then that affects the quality of the leaf. Or affects the growth of the plant.

Would you say that in general you have more issues with water quality than water quantity?

Apart from this summer that would be true, there was a general shortage of water this summer.

Have you also been affected by heavy rains and flooding?

Yeah, so Spain had massive floods last winter, and they also had some flooding last weekend, but that is generally more of a problem on the continent, not so much in the UK, although 2012 was a very wet year, which caused some flooding and a few issues, especially in the North West.

Has it led to any changes in your water management practices?

It's not so much around the water it's around our supply base so we just try and spread our risk by – so with this drought, what it flagged to us, is that the north-west don't have the infrastructure to irrigate as well as the rest of the UK that is more used to dryer weather. They are generally wetter there, so they don't have to irrigate normally. So growers won't irrigate in a normal year, it is more the growers in the south, south east where it is warmer they have the infrastructure to irrigate.

So we are looking to move production away from the north-west. So our factories are fairly north, well, we have two factories in the North West and one in the Midlands.

So would you relocate the factories?

No no we just spread, move production of raw material from the North West.

How about investment in irrigation?

I think what the growers will do is look at that availability but it is very expensive, and if it is a one in thirty year event, so the cost is restrictive, but if we are going to start having wetter winters and dryer summers that will be something to look into, definitely.

But this has been the driest summer since 76 so although 4 of the hottest summers have happened since 2000, so there is a trend, the events are too far apart currently to invest in the north-west. We would need a drought – 1 in 10 years.

How about water use in the factories?

So that is something that we monitor, that is one of our KPIs, if we have a wet summer and we have muddy lettuce, we use a lot more than we would if it was clean. So whilst we monitor that and try to minimise water use, we need to have clean lettuce, because there is a micro association with soil and we need to wash that off. Unfortunately, if that means we need to use more water then that is what we have to do, to make sure it is safe, because it is ready to eat.

I guess, even if it wasn't a risk people don't like muddy lettuce?

Exactly.

Are there any other possibilities to reduce your water use? Are there different technologies that you can use?

Yeah, whenever we are looking at new wash lines, the technology has progressed, there are different ways of cleaning, processing and reusing water. At the moment some of our new lines have a cascade system – so the clean water is at the end of the line and moves back to the beginning of the line as it gets dirtier, so you are reusing that water instead of using it once. Putting down the drain. So that is the quick win but it is difficult to change until you look at new lines and new technologies but where that's been possible that's been done.

And there are pretty big efficiency gains?

I'm not the correct person to ask for those figures but I think it has helped quite a lot.

The new line we have put in the last couple of years actually has tubes in it, so the water, the leaf actually goes down the tube and so it is submerged. So you don't need as much water in a big bath, we have shallower baths – and the leaves actually go down like a Charlie and the Chocolate Factory type tubing.

So it uses less water. Well you need less water to fill it up.

Do you also recycle water?

Not currently but it is something that we are looking at but have not invested in that. So you can put dirty water in at one end and get clean-ish water out the other – but no, we are a bit tight on space, particularly at our Wigan site. But it is something that we have looked at, yes.

So space is a limiting factor? Is it economical to do it?

At the moment, the return on the investment doesn't add up – when we last looked at it.

What are the timeframes that you use to evaluate these kinds of things? How often or how far in the future do you plan?

So horizon scanning is about five years plus. The problem we have with produce is that much of the produce that we have for the whole of Europe comes out of the South of Spain, which is a fairly difficult area for water – so we know that that is a risk. But it is quite difficult to move away from that area. We've looked to move, well we have a small program in Tunisia, but they have similar issues. But as the weather gets to be more extreme, people are definitely looking to spread the risk more.

Have you seen that other areas in Europe are becoming better growing areas?

I think that the south east corner of Spain is still the best currently, but it's not ideal. So a lot of the water comes from central Spain, and it is quite political – it goes through quite a lot of provinces before it gets to that south-east corner, so last winter it was actually restricted because the politics around it are quite sensitive.

So some of the areas it runs through, they want to pull the water out – rather than letting it get to the south east.

So that is also a definite risk.

Is it a natural water flow?

No, it is in a canal.

What are some of the other factors that restrict planning?

The big one at the moment is BREXIT, we are doing some contingency planning for that but it is still all up in the air. We are looking at trying to minimise our exposure when that happens – if that happens – but that has taken quite a lot of focus at the moment.

And I guess, long term, is costs and customers – the customer base is fairly fluid, always looking for the lowest prices so business tends to move around quite a lot between the processors, so we are looking to secure long term contracts with customers but it can be quite difficult.

It is a very competitive market. There is over-capacity in the UK for processing salads. So there is extra factory space in the UK.

Have you also seen changes in consumer preference?

Yeah so people have moved away from the whole head and iceberg, to more baby leaves with more colour and more flavour, iceberg is still our biggest line, but a lot of that is driven by the subway.

How is water availability for your factories?

At the factory in [North England], we have plenty of water but we are close to our discharge limit, so we are looking at how to minimise that. Close to how much we are allowed to put down the drain every day, so many cubic meters. I'm not the expert on that I am afraid.

Can you negotiate with the regulators at all, or do you just have to comply with what they say?

We just have to comply, but I don't know for certain, there is just a figure we have to be under for the weekly discharge.

In the long term – what do you think your strategies would be if your water risks were higher?

So for some of the higher value crops, we are looking quite closely at alternative ways of growing, so hydroponics is one answer as their water usage is much lower – but that doesn't add up for the lower value commodity crops like iceberg.

So that would be one main thing you would look at – is there a difference in water needs between the different types of leafy salads?

Yes, some crops need more, it's not a huge difference between lettuces, but there are some that stand out. So there is a Chinese leaf that needs a lot of water. And for that line there are different ways of irrigating, so a lot of people are looking to use drip irrigation under the surface – mostly people are irrigating with booms and you actually get quite a lot of run-off and lose quite a lot of water.

So Spain uses a lot of drip-irrigation, but the cost of that is quite high, and water availability in the UK at the moment does not require people to use drip because the cost of the water is relatively cheap compared to Spain. And normally you don't get the evapotranspiration that you get in Spain either.

So there is quite a lot of leeway for implementing these technologies in the UK?

Yes, but the problem with drip tape though is that it uses a lot of labour – and labour is becoming quite a big issue here in the UK. Well, everywhere really – for manual work. The biggest thing our growers have talked about this summer is a lack of decent labour and the living wage going up, so the cost of having people harvest crops by hand is very high with the living wage increasing.

Why is drip tape more labour intensive?

It takes a lot of work to lay it under ground – but once it is installed it is pretty easy – but with the booms you have to have people moving them, pulling them out and then they get pulled back in automatically. But yeah, so once the drip tapes are in you can irrigate little and often which is ideal for crops really.

Thinking at a wider level what do think could be done to improve the resilience of the FF&V system?

The big one is waste isn't it. So, I think a third of salad bags get thrown away throughout the chain. We did a project with WRAP last year trying to look at substandard quality in the field to see how we could use that in the factory, and concession it, but it is fairly challenging, fairly difficult to be honest.

So we looked at waste in the field, but the biggest waste is with our end customer.

So we have been looking at extending shelf life, film, and gas flush technologies to try and extend shelf life.

What are the difficulties there?

So it is a fine line between shelf life and quality – and the longer the shelf life the higher the risk is of micro. So the product would go off, you may eat it but the risk is that someone does.

The risks are higher the older the product is.

Are there any practices that you think are really good at the moment?

I think what growers have done in recent years is spend quite a lot of money on reservoirs and infrastructure – so the reservoirs, they can fill over the winter when the rivers are in flood. So you are capturing that water that would otherwise go out to the sea. And then they can use those reservoirs over the summer, so that is common practice. Obviously reservoirs are expensive and there has been some EU funding on that but it helps with water security.

So as we saw this year, if the weather is like it was this year and you haven't got water – you don't get a crop basically.

So that winter rain fill of reservoirs is very good practice.

But I think you need to remember that agriculture uses a very small portion of water – it's just that it is very visible – so if people are on a hose-pipe ban and you see a big irrigator putting gallons of water on a crop – the public don't like it, but the actual volume that agriculture uses in the UK is relatively small compared to the manufacturing industry.

How does beetroot compare to salad?

So water usage is much less. The crop needs more water than salad, but the washing of that crop is relatively easy and then it is cooked so the risks are low. It is steamed so that it is a fairly low usage factory compared to salads.

Is beetroot more resilient?

Yes, so those types of veg crops, whilst they need water, they will still make a product, albeit smaller if it doesn't get enough water whereas lettuce will just get written off.

This week, just out of curiosity, if I have seen Tesco's selling baby beetroot, is that because they didn't get enough water?

It could well be that, but I haven't seen that. I don't know what G's they supply to Tesco's.

I know that they pickle it, as do we, but it could be a way of getting rid of some of their intermediate that hasn't made it to full size – maybe a marketing ploy but I don't know to be honest.

Do you think others might have a different view to you on these ideas about resilience?

I get an overview of the whole UK but someone in the South East might have different views than in the North-West.

In terms of processors, do you feel that people are facing quite similar challenges?

Yes so labour and water is definitely high on peoples agenda – particularly this summer – normally there might be 2 or 3 weeks where water will be an issue but this year it went on for three months really.

And yeah so it becomes a big challenge.

So where people couldn't get enough water on all their crops, they are having to decide on what to irrigate and what not to. And that is a difficult choice really.

You mentioned that you have been looking at new growing areas for some time but have you been doing it with more intensity because of the summer or?

I think we are fairly north-west focused because of transport – so we are looking now in the east. We have been looking at it and moving away, but we think that we need to move more away, but it might not happen for ten years. There is quite a big transport cost, in a low cost iceberg lettuce for example.

END OF TRANSCRIPT.

Farmer

XXX runs XXXXXX Farm in the South West of Norfolk (East England) the soil there is light and sandy making it ideal for asparagus, which he is most known for – under the name XXXXX. His farm also produces onions, potatoes, parsnips and leeks for sale as fresh produce, as well as sugar beets and maize for sugar and livestock feed.

He tells me that water is used in two ways on his farm and processing facility. First, there is irrigation water for the fields. Water for irrigation is abstracted from underground aquifers. Second, there is water used for washing the harvested produce. This water is mains-water. The processing facility uses this water because of food hygiene reasons. Tim notes that the amounts of water used for washing is miniscule when compared to that used for irrigation.

Over his thirty years in the business, Tim hasn't noticed much difference in his access to water, he is aware however that registration for water licenses have always been a point of contention.

He notes that the National Farmers Union (NFU) has been in constant dialogue with the Environment Agency (EA) and the Departments of Environmental, Food and Rural Affairs (DEFRA) since the 90s to negotiate this process – to influence how policy is formulated and delivered.

The future challenges faced by farmers are influenced by research but it is not always so easy for farmers to stay up-to-date with what knowledge research is producing and how it is being used in policy development (farmers are not writing academic articles to communicate their experiences...).

Many of the regulations for on farm practices are handed down from the European Commission (EU), so there are some uncertainties about what will happen when BREXIT is finalised. DEFRA has however been giving some hints about how direct payments (income security) will be re-directed to the environment.

We talk briefly about a recent article in the BBC about how UK farmers will have to produce more food as the UK leaves the EU. He describes it as a *dilemma*. There is a conflict between agricultural water needs, water for other uses and environmental policy.

The environment will play its part to squeeze water use – this is a stress for farmers. The problem is that farmers tend to be reactive as opposed to proactive. Take for example the Water Framework Directive, which has been in place since 2000 (you have to set a lot of time aside to read and process this document). The intention of this document is to provide a guide for returning UK waterways to a *good status* by 2027. It is not entirely clear what *good status* means - but it is understood that *good for the environment* generally means *disadvantage for farmers*.

Abstraction licenses are always under review. The head (safety net) has been removed for most farmers. For small farms, their water allocation is limited to 100% of their use at the year 2000. For large farms, abstraction has been limited to 75%-85% of the 2000 level. Since the year 2000, the years have been relatively wet for the region but only when compared to the 70's. If the weather starts to dry up then we need to have some headroom for irrigation, or a reservoir? But where is the water going to come from?

XXX mentions that there is a pilot project to utilise the Fen's Black Sluice for water storage/re-distribution.

Farmers need more water but how do you manage this? On an individual farm level? As a group of farms? As a region?

How is the stress experienced? Is it as an individual, as a group or as a county?

It also depends on the time scale. If the change is going to come next year, we have little chance to organise and react as a group. If the change is 20 or 30 years in the future then there is a chance for agriculture and water companies to cooperate. Water Resources East Anglia, led by Steve Moncaster, are trying to do something about this.

Abstractions are made over a very large area, there is bore hole water and there are reservoirs. Each farmer has a different attitude to risk as well, so formulating policy to suit everyone is going to be difficult – no one-size-fits-all solution.

Policy also tends to be written in stone. It isn't flexible and takes a long time to change. It is the water companies that have the most impact here and for them farmers aren't the biggest concern. If public water supply becomes subject to stress the government won't last long. A similar thing might be said for environmental pressures. These are the main focus areas of the water companies.

Research informs the supply of water – distribution and storage capacity – and this informs the price of water. Domestic customers are the main focus. We note that farmers are customers too, but Tim reminds me that it is at a lower scale (although some companies are willing to support/help farmers).

We talk about what other challenges are being presented to the agricultural sector. Tim notes again that the environment is centre stage. BREXIT will also play its part. How will these factors shape farming? Water is of course key, but it is just one part of farming. There is international trade, labour markets, and pinch points for chemical use and pesticide residue levels. How many British-born people are you going to get to cut asparagus and dig potatoes? – Not many.

Is it going to get easier for farmers – not likely.

Wholesaler

XXXX's experiences are broad. As an agronomist, he has worked with growers, pack houses, followed different techniques of cultivation in different soil and weather profiles across the country (say for example, with sandy soils and high rainfall – these are the best conditions for potatoes). His work further extends to include an understanding of fertilizers, sprays, technical management of factories and laboratories, Potato Crop Management, the development of disease and drought resistant sorts, the improvement of soil – and how run-off from farms and leaching affects surrounding environments.

For now his main focus is potatoes and onions for XXXXX.

Water in his context relates to the irrigation of sandy soils for potato and the actions of growers and legislation. In terms of resilience, this has to do with reservoirs (investing in them), and the use of organic fertilizers for soil structure that retains more water (reducing the amount of water wasted/lost). He notes that about 17000L can be saved with a 1% increase in organic matter, or 3% run-off as opposed to 5% - this is significant when thinking about total water used.

Interestingly, XXXX suggests that there is a conflict between food safety policy and sustainability (i.e. water use). Here, supermarkets have a policy regarding the use of bio-waste (organic manure fertilizer) on fields whereby potatoes cannot be harvested from those fields for a period of 10 months following – for lettuce it is a period of 5 years! There is a sentiment here that suggests that bio-waste is too risky – and supermarkets are scared (over-scared) for threat of a food scare.

XXXXX suggests that we are too clean of a nation. Bacteria in the soil is good for nutritional outcomes. Further, machinery doesn't have to work as hard, reducing the amount of diesel needed. Better soil structures result in better field efficiencies.

XXXX says that before his time, farms were mixed purpose. There were cows, sheep and pigs, for example rotated with crop farming which would prepare soils as such. Now farms are specialised and you won't find too many animal farms in the East of England – but plenty of single crop farms.

This also means that anaerobic digesters are needed for processing animal waste – and farms are paying for manure.

But again the food scare risk is always there. Another alternative is to use cover crops between harvest seasons that break down/are mulched to add organic matter to the soil.

In-organic (bagged) fertilizer makes it easier to calculate the amount of nitrogen in the soil for example. Farm manure is more difficult to test.

Watering early battles common scab – although this doesn't affect eating quality. This requires a lot of water, particularly in warmer seasons. Water is also necessary for lifting potatoes where the ground is too hard for the machinery.

Maris piper is the base line potato for water use across all potatoes as it is the worse for scab (note, over watering causes other issues).

Generally speaking, farmers will apply 25mm of irrigation per week. If the season is dry however, scab will form anyway...

Evaporation and transpiration rate. It is not measured enough. Up to 7mm of water a day can be lost and to monitor this requires the resources and equipment to do this everyday.

There should be a more integrated focus of water, farming, efficiency and economic outcomes. More demonstration farms like Elveden. And more look-see experiments – seeing what happens between seasons – using control potatoes, putting potatoes under pressure – growing potatoes cheaper – evidencing cost savings – advising farmers through AHDB, NIAB etc.

Simon tells me that much water is wasted in the form of potatoes that don't meet market requirements. He uses *scab* as an example – an aesthetic condition in potatoes. This has nothing to do with taste it is purely about looks – but supermarkets are not interested in reducing the specification that reject them – consumers start complaining...

These potatoes are often sent for processing – when there is a good yield, supermarkets can be selective of which they buy in. In poor yield years however they prefer to import them as opposed to reducing the specifications – this happened in 2012.

Reservoirs are necessary for resilience – many growers who are independent and don't benefit from corporate investment and rely on abstraction from rivers and ground water – but what to do when there is no winter fill?

NFU are helping farmers – but perhaps not enough. It is necessary to support farmers in supporting themselves.

Policy needs to look at the impacts of water shortages on water for irrigation as well as domestic water for washing.

Other important factors that will affect the industry are BREXIT and uncertainty around chemical use for resistance building etc. Neonicotinoids for example.

Policy/Govt

XXXX is a member organisation with a membership base of 46,000 farmers and growers across England and Wales. The work XXXX does is divided into two halves – policy, food and farming on the one hand, and non-commodity legal, environmental and technical support on the other. Much of their work revolves around political representation for farmers and support in responding to regulation, legislation and so on.

XXXX tells me it is difficult to say exactly what proportion of UK farmers XXX represents as business structures vary across the industry – there are those members that are registered as individuals and those as businesses.

There is also a difference between farmers, growers and *landowners* who are often represented by a different organisation – Country Landowners Association (CLA).

Other institutions provide more focused, specialised services too. Cranfield, XXXX notes, is particularly active with respect to horticultural trade with a focus on high value and ornamental crops.

AHDB is the centre of collecting information from its levy payers.

The strength of XXX lies in its effectiveness in knowledge transfer in an otherwise fragmented agricultural and horticultural sector.

With respect to water, it is clear that all farmers need water for their businesses – rain, mains water, abstracted water – when talking about fruit and vegetables, and water – we are talking about abstracted water. Policy manifests here. Irrigated crops in particular are face the most risk (specifically in the East and South East of England).

We discuss how quickly farmers are able to react/act in response to policy change. It is difficult to say whether a reaction is quick so to speak. Often policy comes in the form of directives and actions to follow, some can be adopted quickly, say filling out an excel spreadsheet which in many cases farmers might already do. If we take the Nitrate Directive for example farmers will already be documenting what organic and inorganic fertilisers they are using.

Other activities, action programmes that result in different ways of working, additional capital expenditure etc. take longer and are more problematic. In the case of run-off and cover crops, monitoring run-off and regulating the employment of cover crops is difficult, and will take 5 – 10 years to really firmly root the practices on farm.

Where capital investment is concerned, these measures are usually unlikely unless grants are available.

Paul indicates that policy isn't one thing – where policy might be used as a catch all term – there are directives, policy (with policy goals), legislation and regulation – and each present a different approach to incentives and penalties (carrots and sticks).

In any case, XXX believes that policy really can only be effective where it is adopted voluntarily – this works much better than regulation. Or at least, there needs to be a balance between how farmers are incentivised and penalised.

For the matter of water scarcity and water risk – much effort has been placed on how farmers are allowed to abstract from ground source water. Farmers instead need incentives to build their own storage capacity (dams/reservoirs).

XXXX has played a fundamental roles in working with EA to understand how existing regulation and policy affects farmers – and how to manage water sources that are over abstracted and over licensed.

This extends beyond farmers but also includes water use by the public sector and energy production. (domestic supply is the most dominant user).

Isolated farm abstraction

Water Framework Directive – the main focus/primary water regulation

No deterioration from agriculture. All water bodies should be of *good status* by 2027, or if not possible due to financial constraints, they must not deteriorate.

If they do deteriorate, there will be significant environmental consequences.

The sustainable abstraction programme.

The expiry of abstraction licenses

Annual volume of abstracted water to be based on dry year needs – on an average year, (rainfall) half the permitted abstraction water is used.

A focus from EA is that if there is a good rainfall year and where abstraction is based on dry year volumes, production will expand which will lead to more damage to the environment.

Farmers are otherwise handicapped – they need some headroom.

Abstraction Reform – Defra to change regulation – licenses to permits

Catchment Management would be a better approach – water used more efficiently at catchment level – reduced volumes of available water puts farmers at risk of dry weather.

There are principles that are accepted by farmers – that water needs to be shared and transferred between uses – but this requires detailed planning that isn't being done.

This might be better over all i.e. across the sector, but at the individual farm level there will certainly be winners and losers.

Increased demand for water stems from a demand for improved food quality – for example – skin finish – to rely on rainfall, there needs to be the right amount at the right place and the right time – otherwise you need irrigation – and really this is a waste!!!

Supermarkets are all about appearances – since the 1970's there has been a demand for the blemish free potato...

England and Wales hydrology – we have very small bodies of water, small rivers, low energy rivers etc. compared to other countries in Europe – the Italians have water from the Alps, the Spanish, water from the Pyrenees. In Australia, you have the Murray Darling – here there is the ability to dam water, and manage water locally, you can measure how much water is available for irrigation, but in the UK we don't have this ability.

The River Wissey in Norfolk is agriculturally important 25% of water from the rivers is for agriculture, which is high.

(This is a good example why the Water Framework Directive – an EU initiative – is inappropriate for the UK context – at the moment, it is as if we are just pretending to follow the directive)

We need something that is fit for purpose – that follows the principles of the directive but something that is UK relevant.

Environmental Regulation is much more advanced than what we can keep up with – there needs to be some compromises...

Precious water based environments – at odds with the realities of agriculture. Ground water is not recovering.

Effort to nourish important rivers needs constant focus – establish stronger relations between farmers, environmental management etc. support for farmers to keep up.

Working with future scenarios (i.e. the Cranfield Scenarios workshop) was difficult although understandably necessary to consider what challenges will arise in the long term – the longer the time frame however, the larger the variability – and this isn't so useful in addressing the issues we are facing

currently. We are limited in what we can do where the horizon is 50-60 years... XXXX and farmers more generally can only really cope with timeframes of about 5-10 years.

The important part of the scenarios though, and in linking to the WRE (water resources east) project, is understanding/visualising the intersections of water, energy and food – and understanding the different perspectives that populate water use.

Water use in agriculture can learn from public water supply – but also contribute to the debate about efficiency and water saving as well as make a point for the imbalance between water for agriculture and the more dominant public supply.

With catchment management it will be more likely that users can collaborate and manage water availability and generate a potential demand policy – thinking about water in the widest possible context (including flooding as well) – this would also include a sector that is alive to soil management too – soil moisture deficits are important to consider.

Water needs to be managed constantly – which requires constant knowledge exchange.

Water Policy/Govt

For XXXX, managing water between domestic supply and commercial use (farming), catchment management is a key aspect of their work – not about engineered solutions – but by talking to farmers, understanding behaviours and understanding how they can work together.

As a supplier of water, they are interested in water quality and water quantity, that is, for drinking water. As such, pesticide run off is as much a concern for them as having enough water in the first place.

He notes however, that pesticides are really very crop and region specific. You can't generalise for all of England say.

For fruit and vegetable production water comes in the form of surface water and ground water.

These are local to fields and farms – the risks are therefore localised too.

This water is also used to service domestic customers – so the risks are also local to them – again with respect to the quantities available.

When talking amongst farmers, other water users, regulatory bodies etc. the most value is found when there is an understanding of how water can be shared.

Sharing is in the form of *abstraction licenses*, XXXXX '*big pumps*', EA's *management of environmental impacts*.

For XXXX it is about when to pump and how much.

Licenses help to identify water shortages.

EA also regulates (*they police us*) XXXX – keeps them in check – multi-phase assessments, and a reactionary approach to dealing with the outcomes of these assessments – *this is what happened, this is what needs to happen etc.* – at a formal level. They play an enforcement role – managing expectations about drinking water, sewage – also for the other big water suppliers EAW and Thames etc.

EAs job is about identifying who all the water users are (not just farmers and domestic users).

If there are pollution events – prosecutions follow

Managing the impacts on the environment, water quality and so on are not only about relying on engineering solutions to problems i.e. looking at products that are causing issues (pesticides for

example) but acknowledging that there is a need for monitoring, seeing the possible issues in advance, continuous revaluation of water regulations – a feedback between water suppliers/users/EA.

In this respect, there are many events held for farmers. Helping set the agenda for farmers. There are workshops, conferences and the like, and attempts to generate catchment partnerships.

There are sentiments of *naturally, doing the right thing – there are friends and then there are tough decisions*.

One-to-one interactions with farmers are also important – here it is important to find independents who can talk to farmers – people that are good at selling the positive story – *I have a successful business despite following the rules*. Independents are more effective – farmers are more likely to listen to them than to us.

For farmers it is important to identify how resilience translates into business.

Big farmers can also be instrumental in spreading the message – in this sense it doesn't matter where the message comes from, as long as it gets through.

Richard gives an example of the programme to stop the use of slug killing pesticides on farms (SLUG-IT-OUT) – this chemical is near impossible to remove from water streams – it doesn't have any human affects – but in terms of regulation for the chemical content of water it is a big issue.

The goal here is to have 100% uptake. One approach has been to persuade farmers with financial incentives.

An important aspect to any change in farming approach is to ensure that farmers are *in the room*. As long as farmers are there, it is good. If we are talking then we are part of the solution.

An interesting dynamic for in agriculture and farming however is the contracted farmer – who might not be as invested in the long term aspects of a given farm/land and surrounding environment. And the grumpy farmer – who needs things addressed in an agriculturally sensitive way.

The SLUG-IT-OUT programme highlights an additional nuance to the dynamics of regulations for pesticides more generally. Most pesticide pollution can be managed with UV or ozone once it is in the water – pesticides affect drinking water, but it is not appropriate to put a blanket ban on pesticides in this respect. There is a difference between upstream and downstream impacts – it has to be managed locally.

It is also worth thinking about how pesticides find their way into waterways – it might also be a case of using rain guns on potatoes – it isn't necessary to use rain guns and they are responsible for run off. It may be better to manage irrigation approaches in this case.

Link up to big companies to support management and high profile farms to help spread the message.

Water companies shouldn't be leading research – but they can work with farmers, NIAB, Cambridge etc to do trial farming – this needs to be large scale though – not just small scale – and where we can collectively look at the outcomes.

For the case of pesticides there needs to be monitoring – not to be published publicly – but enough to work with specific farms. Need to prioritise the water/farming interface – farmers have a lot at stake as do water suppliers – dialogue needs to go both ways.

Water companies can then work based on research outputs.

Metaldehyde has opened up the question space – networks, brokers of knowledge, teaching the teachers – a big change in approach for water.

Whom does the farmer turn to for advice?

Needs of customers – drinking water – quantity and quality – population growth – demands of a town in 25 years? Hose pipe bans... drinking water is paramount.

Water recycling – locally vs pumping discharge – it might be overall cheaper to recycle but the output is necessary to support local biodiversity too.

How might we go about managing expectations for water – what new rules will there be for drinking water?

Reservoirs are another big option for resilience as well as large capital investment in improved irrigation technology. The issue here is that when water is available and cheap it is hard to make a case for these options.

How to package the message? How to convey efficiencies, protection of water bodies, and long term benefits to farmers?

Waterfowl quite like large reservoirs.

Appealing to hearts and minds.

This is particularly important now where political issues become a matter of perspective rather than scientific. Not determined by facts but emotional.

Round-up is the most widely used herbicide. It has been classified as 'possibly carcinogenic' from 'not carcinogenic' – up for a 15 year license review...

Neonicotinoids – killing bees? The science can only say that it might not be causing the problem... but consumers can understand the image of damaging the environment or of being poisoned... retailers listen to their consumers – and retailers feed back...

Water is currently fashionable. Before it was air-miles.

Where it is 'emotional' decision making that plays such an important role – building trust is paramount. Building credibility – demonstrating and communicating outcomes.

Woodlands Trust – visiting farmers to plant trees – building trust between EA and farmers – not just about slagging each other off...

There also needs to be tighter legal requirements – a balance between volunteer action and regulation.

Drought and Brexit will bring challenges but perhaps also an opportunity.

More reservoirs? Treating water in the reservoir? Deciding when and what to pump in/out of the reservoirs. What are the implications of these actions. Is there even any water to go into the reservoir?

Warm winters, drought, flood? Resistant crops...

Farmers are good at adapting.

Water Policy/Govt

The XXXXX movement works to protect, promote and enhance our fresh water ecosystems for both people and wildlife.

Working on the ground and in the heart of communities to promote a sustainable future for river environments.

Administrators of the Catchment Based Approach.

XXXX is working with the XXXX for a 7 month funded agreement between Coca-Cola and WWF. His work is to provide proofs of concept for engagement between partners for catchment/water resource management.

The organisation was started in XXXX in the XXXX by farmers and anglers – who were having shared problems with water but had no one to call. Their initiative moved to include all of the west country and now they oversee 65 sites/water bodies and have grown from a staff of 1 person to 30 people.

Championing the 108 catchment management approach the Cameo project is well developed (funded by Coke)

They operate through small trusts to engage with businesses. Research is being done in connection with UEA.

Important to this approach is understanding who is doing what – we use conferences and meetings etc to make sure we are not re-inventing the wheel. It is about keeping tool kits and platforms simple. It is about developing a coherent understanding of the geography of conservation.

This is one of the main barriers to positive change – developing a sensible geography of habitats, species – not just coloured blobs on a map. Everyone is very good at generating coloured blobs on a map... but it isn't translatable – converted into actions.

Restoration of rivers (in accordance with the WFD) is the key timeline for this type of work. The conditions of rivers is better than the 1960s but we are currently going backwards – 2.9 million tons of soil is lost each year... this is having a damaging effect on rivers.

There is a lot of work to be done – research always just suggests that more research needs to be done – we are a charity and don't have the capacity (money and time) to be proactive – Natural capital is the new industry, as is Brand Politics. We need collective action.

For catchment management it is a variety of users that bind everything together – soil and water are inherently connected and as such so is good business.

Catchment management hasn't been adopted as DEFRA have vested interests in the rivalries between branches – birds, trees, water focused branches are all in conflict with each other.

Catchment management isn't straight forward – you can't just change things at one level it needs to work its way from the bottom up.

To get this moving the approach really needs champions – the Cameo project is a good example of this and even has a business board attached to it – thinking through what the issues are and what some potential solutions might be.

The 2025 commitment/partnership is an attempt to encourage an industry wide commitment to reducing waste (as its main focus) – it is not focused on water targets per se however there is an alignment with water/operational efficiencies that will hopefully have positive effects.

UK Leap is another initiative encouraging retailers to commit to reducing water issues... this will be measure in 5 year chunks which means that re assessing the situation, outcomes, actions etc will also be occurring at this pace.

There is an interesting link made between research project cycles of 2.5 – 3 years – where the work done in this time is compromised by the reconfiguring of teams, research foci, stakeholders, the trust that needs to be developed between them – change takes time which cannot be captured fully in short term project focus.

At the extreme ends of the future of UK rivers - if production is almost completely sent abroad – this would obviously be a very positive outcome for river health – but of course we would be exporting the issues too.

That being said – I am a firm believer in sustainable farming – both farmers and the environment can benefit from one another.

Wholesaler/Retail

XXXX focuses on Food Safety Policy and its relation to environmental outcomes. In parallel, Lucy also works as a consultant to the fresh produce industry with respect to supply chain management with a particular focus on sustainability.

XXXX provides an example of a trade-off between food safety strategies and environmental management: In order to satisfy food safety parameters, farmers are not allowed to use raw manure in their fields as fertiliser (organic fertiliser); they must instead use inorganic varieties. The trade-off here is the risk of bacteria spread as a result of manure, and the run-off from inorganic fertilisers of which is a contributing factor to water-body pollution. Fertilizer promotes algal blooms, which starve water of oxygen, necessary for supporting water-based biodiversity etc.

XxX has extensive experience working with XXX. She notes their Field to Fork focus, and their position as an industry leader – a company that many other retailers follow, or use as a benchmark. ALDI, as an example, will often use XXXX approved suppliers/sources as they know that XXXX has already acknowledged/accredited them as adequate.

We talk about whether there is lobbying amongst food safety and environmental focus groups amongst the retailers – that is, how is it that food safety takes priority over environmental impacts. Lucy tells me that lobbying isn't really necessary. Many decisions are brand-value focused. No one wants to be implicated in a food scare. This would be much more immediate and detrimental to a retailer than environmental impacts, which tend to be more diffuse and harder to pin point a root cause etc.

XXXX sums it up as a matter of accepting certain risks (environmental) and making food as safe as possible.

XXXX invest a lot in their technical teams. Retailers have teams of people that manage sourcing and supply from suppliers/growers. A supplier is the middle-man between growers and retailers. They will often be the ones that deal with imports and logistics. The retailer teams are made up of commercial people (buyers - those that manage costs) and technical people who assess food quality and safety, packaging and processing, and so on.

Depending on the retailer, it may be the buyer's agenda that is prioritised over the technical – At XXXX, the technical teams are strong, they are able to influence decisions that support higher quality over lower costs, but for Sainsbury's say, it is the buyers who are king. M&S have a lot of respect for food technologists – while others see it as sales prevention.

Safe, good quality, legal food is the clear message.

As a side note, Lucy acknowledges that Buyers tend to work in retail for shorter periods of time than Technologists. This has an interesting outcome. Namely, Technologists tend to have more experience working with issues across the supply chain, and working with specific countries of origin and therefore are more inclined to listen to the supply base – to say help them with specific issues they are facing. Buyers are less informed and therefore make decisions in different ways. The more pull a buyer has, the more dramatic the change in supply profile can be. XXX gives the example of Sainsbury's currently which has a more-or-less purely buyer focused approach, and next to no sustainability focus – they ignore sustainability assessments.

If retailers are focused on sustainability – they are often only versed in sustainability in a general sense, not necessarily experienced in fruit and vegetables.

Teams should be set up so that fresh produce has its own water/sustainability/etc. focus. But for most retailers you would need to be able to prove that this adds value or works to protect the brand – if you can't do that then you are at a loss.

You can bang the drum, but without being able to prove you are improving the economic bottom line, no one will listen to you.

Retailers dominate fresh produce supply chains. The retailers *approve* the supply base. In this sense the supply base is also restrictive – it is a matter of whether retailers are interested in investing in the supply base to find solutions amongst a broader set of suppliers – that is, to provide greater access to markets for growers (here we might think about the diversity of supply bases) – or if a particular set of suppliers are experiencing issues locally, retailers can make a decision to help them, or abandon them and find alternative suppliers.

We can think about this in a number of ways. For fruit supplying countries – if there is a drought, retailers can help their suppliers manage, or they can *abandon* them and get their fruit from elsewhere. This also presents a trade-off between what we might call *national water* and *protecting investments*. On the one hand, retailers don't want to import drought – they want fruit to sell to their consumers – they need to protect their business interests. Clearly, water allocated to the nation and not to fruit production for the UK has its benefits – but perhaps not if you are a fruit grower with a large community of people relying on your business. What happens where retailers are just making decisions based on cost?

In this sense, retailers have a big impact on what happens on farms – they set the benchmark – biggest, best, most innovative farms are usually the ones that make it. Those that are able to live up to and adapt to set codes of practice.

There are also legal systems in place – due diligence – for the supply chain – to produce fruit and veg that are as safe as possible. In the UK, the rules are quite strict when compared to the US. If the rules for the UK are too strict, it could in theory mean that growers will seek different markets – say for example, China and Russia.

This is also a similar case for trade tariffs – what goes where is also a matter of economics.

There is a general sense in the UK that *of course growers want to supply to us...* this attitude could potentially be dangerous.

XXX uses the metaphor of *ostriches* with respect to the government on this issue – telling the retailers that: *they are the experts they should do what they think is best...* whilst hiding their own heads in the sand. This form of governance makes the UK vulnerable.

Something might be said of commercial people amongst retailers too. We discuss the visioning/backcasting/scenario work for the project at hand – Lucy notes that scenarios will be a good way to see how things will play out – but commercial people are likely to get scared.

She also notes that this approach is a very NGO/Academic way to approach strategy – the headline for retailers should be about savings – how they could win more business – or protect their brand. Ideally you could bring it alive with a case study about *cost*.

Retailers have the most *skin* in the game. Growers are more responsive to Retailers, than they are to Buyers/suppliers (they are *yes men*) – any suggestions from Buyers/suppliers are likely to be met with a *sod off...*

In this sense, a lot can be said of loyalty between growers and retailers.

Audits also play a role in how things are done on farms – depending on how many retailers a grower supplies to, they can be exposed to all sorts of different audits (Global GAP, M+S, Tesco, Independent Auditors such as SAI etc.) really they all say the same thing, over and over... Water quality for food safety is a central focus – pre-harvest, post-harvest, and microbiological safety... this surely results in wasted water... and further reiterates the trade-off between food safety and sustainability.

No one is giving this much attention though.

Policy/Govt

XXXX have a 10 year volunteer agreement to focus on reductions in Food Waste, Carbon Emissions and Water Use.

The goals for Food Waste and Carbon Emissions are quite clear-cut at 20%.

Water however, is less defined.

An example for how XXXX is addressing water in food production is given in the form of a case study considering strawberry production in Spain. Here the project focused on a reduction of 50% water use for strawberry production, which in the first instance was having a significant impact on water availability for domestic use and ecosystems services, but was also the result of over-watering.

This project has subsequently lead to further projects and the development of 'heat' maps – i.e. identifying water-overuse hotspots – very much in the vain of the work being done by the project at hand.

XXXXX acknowledges however that such an analysis doesn't tell the whole story. It can only say where water is scarce or where water might be misallocated. It does not say anything about how water and food are accessed and by whom.

For UK based projects being undertaken by XXXX, their focus is Kent and East Anglia.

We talk about food waste and its connection to water use. Much of pre-farm-gate waste is the result of over planting. Growers have contractual engagements with retailers that demand certain quantities of produce. As a reaction, farmers plant more crops than necessary to overcompensate for unfavourable seasonality. Where seasonal conditions are favourable, the result is a surplus of produce that if not consumed is wasted. This obviously also equates to the relevant amount of water wasted too.

Emphasis is placed on encouraging farmers to rearrange this practice, but requires input from retailers too. Water availability and climate variability are not adequately predictable to ensure that farmers and retailers can be clear on what is possible within the limits of the resources they have available.

How to secure food on the table using less water?

How to have a resilient system without a cushion? i.e. a buffer zone for additional water use, or poor crop yields?

There is also competition between water users. Irrigation is only one part of water use – there are environmental and urban allocations of water too. This also poses a barrier to water reduction.

Obviously, farmers will use as much water as they can be allocated if they know that un-used water will be reallocated elsewhere.

As the weather becomes warmer and dryer – water use goes up across all uses of water, and of course crops that would normally be rain fed need to be irrigated.

XXXX is aware that farmers have little say in how policy is developed.

We turn our attention to consumers and a previous project Bojana has worked on, namely the segmentation of consumers in the UK. Two groups are mentioned:

- 1) Those with strong values, and whom exercise these values in the choices they make; they are sensitive to new information about health, social justice and food ethics, and the environment. As a variation on this group, there is a scale upon which consumers also value convenience.
- 2) Those that don't want to change from their current system of food choices despite impacts to health and the environment etc.

Here there are two types of resilience dynamics – those that adapt, and those that are robust to new information. Clearly, these types of resilient, or perhaps, resistant behaviour can compete with other forms of resilience, for example, where a resilient system calls for systemic change.

Although this mode of segmentation is doesn't set out to also segment UK society based on socio-economic assumptions – it is noted that currently eating healthy is expensive, fruit and vegetables are expensive. There is an issue of access.

Changes in accessibility – i.e. where fruit and vegetables become more accessible – water use also increases.

An example of lettuces and courgettes is given. Last year due to low rainfall in lettuce and courgette producing regions there was a shortage of supply. For most consumers alternatives are available. If your business relies on these commodities then a different issue is at hand.

Water issues come in many forms. There is too little water in the form of rain and water bodies (drought) and there is too much (flooding) and over saturation. This also results in the erosion of soil and affects soil quality. Weather variability is an issue.

Where seawater leeches into ground water aquifers or surface water bodies there is also an issue of salinity. Certain types of spinach can thrive when grown in these regions and can help absorb salt from the ground. It is noted however that salad crops are seen as an unnecessarily high water burden.

Other matters of concern include the future of domestic and foreign labour following BREXIT, trade agreements, subsidies for horticulture and public health policy – it would appear that help to support farmers or a healthy society is not readily available.

Policy/farming

the organisation has since grown to employee 21 people, working in 38 countries, and with 9 demonstration farms around the UK (England, Scotland and Wales).

XXXXs work in the first instance, comprises the generation and dissemination of knowledge about integrated farm management. Farming included here is not necessarily organic, focusing primarily on modern and conventional farming practices.

XXXXX approaches issues surrounding farming – waste, energy, water etc. not as single issues but as integrated and often competing issues that need the trade-offs and synergies of which need to be managed.

XXXXX notes that there are certainly trade-offs between agricultural infrastructure and natural resources – *we are eating these resources*

Often we find that many of the issues surrounding environment and agriculture result in *finger pointing* at farmers.

XXXXX attempt to work at the intersection of farmers, the environment and consumers – where the idea is that consumers recognise the work farmers do, where farmers are recognised throughout the industry for their improved practices.

This they do through working closely with farmers to review their farming and management strategies, but also through public engagement, for example through their XXXXX event, which invites the public to visit farms in order to get a first-hand insight into what goes into farming.

Last year the event attracted 272,000 visitors nationwide.

This type of attention however is not automatic it has taken a lot of patience has required a lot of attention to consistency over the many years of LEAF's operation.

More can be read about XXXX impact through their annual Global Impact Report.

Dealing with *Johnny-come-latelies* – new comers to environmental/integrated farm management?
Conflicting advice or management strategies?

XXXX operates with a Theory of Change philosophy – articulating futures and working backwards to develop strategies for those futures. The key to this planning activity is to identify what predictions are necessary and then working to develop appropriate prediction technologies.

XXXX is also XXXX certified (XXXXX is an organisation supporting a movement of credible and innovative sustainability standards – to improve the impact of standards, to define credibility of sustainability standards, increase the uptake of credible sustainability standards, and improve the effectiveness of standards including driving innovations in standards).

XXXX works with farmers to define what sustainable outcomes and outputs are for a broad spectrum of issues. XXXX tells me that just looking at bird populations for example is a *fairly blunt instrument*.

This is also set in contrast to current policy mechanisms for agriculture. Much policy is developed in isolation from farmers, or where farmers can feel isolated by policy and where they are often seen as scapegoats in the case of environmental issues. They are easy targets.

Policy writers are frustratingly impossible to work with – especially now in light of BREXIT. The Government thinks that they can develop an agricultural policy in (hiding) isolation without including farmers and then present it once it is finished... it isn't going to work.

In response to this, XXXX is also committed to Farmer-to-Farmer communication, knowledge sharing/exchange.

Each year XXXX hold two private events for their farmer members. These events include farm visits, networking dinners, and a conference. XXXXX have also established innovation centres across the country that are set up to interact with farmers, the public, research and so on.

The XXXX approach is that innovation is key to sustainability and that resilience is a step in toward sustainability long term. Also required is a focus on social responsibility. Each of these elements is the product of a continuous process, dialogue and action, it isn't about problem solving where problems are solved for good, it is about acknowledging that problems are always emerging in different forms and will always need to be addressed.

Innovation activities are able to respond quickly to issues where as agriculture as an entity is more slow burning.

6 sustainable steps and case studies around water – also see simply sustainable water/soil management etc.

The interface between water and agriculture looks at pollution and resource distribution. It is competitive – we drink it, it is necessary for agriculture, we water our gardens with it.

On farms, there is a focus on drainage and pesticides, on how farmers irrigate and changes in rainfall, at trickle irrigation and other water technologies. Breeding for drought resistance is also mentioned,

but it is also about how farms can waste less which links to skin finish for produce, the quality and timing of harvests.

For some farms up to 16 people are employed to manage irrigation – there is so much attention to detail when it comes to water management and water efficiency.

In the case of shocks to the system, farmers would not be able to respond quick enough hence the need for improved prediction technologies.

We talk briefly about nutrition in a growing population. XXXXX suggests two types of food. Formulated Food and Functional Food. These concepts are about cell management in fruit and vegetables, and about the diversity of the food we eat – that is, the more diverse our diets there more benefit we gain from them. She notes that 75% of all vegetables we eat come from just 12 plants and for protein, 5 animals.

She also notes that people eat what they know. Pizza, Fish and Chips, Chicken Tikka, Pasta and so on. Fresh vegetables don't have a presence in these foods. What would it take to enhance the nutritional value of a pizza?

What about Health-by-Self? People monitoring and engaging in their own nutritional outcomes.

XXXX suggests that a model promoted in the US by Gus Schumacher and championed by Michelle Obama – for low socio-economic communities who rely on *food stamps* could double the value of their coupons by using them to buy fresh vegetables.

Clearly, the more fruit and vegetables demanded the more that has to be produced. Water efficiency will be key, but also opens up for more wastage. We mention briefly Jevon's paradox – the phenomenon where the more efficient something becomes the more it is used – which works counter to the intentions of making it efficient in the first place.

We talk about what the most important and uncertain factors looming over the fresh fruit and vegetable industry.

XXXX tells me that under BREXIT it will be labour and trade issues that will play the biggest roles. Where majority of labour in the industry is sourced from central and eastern Europe, who will work if they don't have the right to do so? What will happen to the strength of the pound? What will trade agreements look like? With Ghana, Spain, France etc. the industry will quickly move out of the UK. G's for example will move their business to Europe. There are already 320 lorries driving across the channel every day/week/month? They will move their enterprise elsewhere.

The government needs to be more active in setting up regulations for supporting UK industry, establishing private/public partnerships – currently there is no incentive for businesses to stay, retailers and business also need to support the government. There is an overarching issue of trust and control though.

Every time the government has set up anything that looks like a private/public partnership – they get worried about how much control they have and how much they can trust the industry and the arrangement collapses.

Water/Policy

XXX's work at the XXXX focuses on understanding how research can relate to business, and how students can build their skills translating theory into *real world* applications.

The success of her work relies on water companies, research institutions, policy makers, and businesses engaging and working together.

The centre's work has four broad themes – Enviro-Social Resilience – having enough water (supply and demand) – Understanding patterns of precipitation - drought – demand side change and a resilient demand side.

She acknowledges that this is not an engineered/solution based approach – but about speak and engaging with the various actors involved. XXXX makes a reference to the Meyers-Briggs Test: XXXX *would be an ISTJ organisation.*

They are focused on working with consumers and providing regulatory feedback.

Reference is made to the OFWAT PR19 for Ecosystems Services

XXXX has a particular interest in Science Communication – Just expressing what is being done is not a particularly good way of engaging – instead stakeholders should be involved from the very beginning.

The *impact approach* usually put forward by research councils i.e. *look at what we have done* is not so good – conversations need to be started early with the right people.

The XXXXX focuses their communication efforts through workshops and small working groups or round table discussions – but also through industry facing conferences – disseminating the research knowledge they have collected to EA, DEFRA, Water Companies and the like.

It is a continuous effort.

It is important that research isn't research for research's sake – i.e. farmers and stakeholders *helping out research – fielding research questions* where research is intent on achieving what *it* sets out to do – but rather establishes its research questions by virtue of engaging with the field in the first place.

Their needs to be trust between researchers and stakeholders (farmers) and research needs to be the flexible party.

Also research cannot only be what is commissioned by companies – reactive and tactical – but more truly collaborative – this would require pushing the boundaries of the research mechanism...

PhDs and Post-Docs doing research for a limited amount of time before moving on – they need to know the questions in advance before setting out to do the research – if it isn't well defined with would be a disaster for the researcher (particularly with respect to achieving a PhD) – this conflicts with working to actually understand the questions that need to be asked.

Applied research – links between research councils and the industry

Research Councils require that Impact is shown – but this is a nominal commitment – a better than nothing approach – it should be more about showing the pathways to impact.

Research Councils are in a difficult position however – it is tax payer money – they need to be able to show the value of the money spent.

The WRE project is helping to address the complexities of the intersections of water, the environment, industries and businesses – to identify the role stakeholders play (industrial and environmental in balance) – understanding where water is actually used.

It isn't useful that governance around water is fragmented. There are regional levels, industrial biases and there are water companies.

There are also internal drainage boards and flood risk assessments (as well as drought).

There isn't really a *front door* to get in and talk to this sector.

Knowledge exchange is paramount. Particularly with BREXIT looming there will be issues with EU funding schemes, what food is to be produced domestically and how self reliant farmers can be. What will farmers be doing, what farming payments will be in place, what will farmers be asked to do, what will happen to the environment...?

Policy decisions will happen quickly – how will the field manage this? Will research being done now still be relevant in four years?

The farming industry is made up of lots of small businesses (farms) connected to very large organisations (retails for example) – it is important to remember this dynamic too

Wholesale/Retail

XXXX specialised in technology and innovation within the fruit and vegetable supply system. He has a PhD in Crop Protection, is an expert in insect pathology, research management and has worked for many years as Director within fresh produce companies.

Currently he is a consultant working with innovation for new businesses and big business. In the context of irrigation he works at the interface of consumers, retailers and farmers.

He considers himself a broker of information – and is interested in the ways that growers and retailers think – the drivers of decision making processes.

More recent innovation projects have been centred around significant water and irrigation management.

He gives the example of mushroom growing in the UK. Currently the concept of precision cultivation is very basic – that is, growers base their activities around their experience – how much water, nutrients etc. to apply and when is based on *feel*.

His work is about getting growers to rethink water use. How to make it more efficient.

Sensor systems and smart tech is one such approach.

Historically there haven't been any tools to monitor soil saturation – it is really only drought monitors that have worked.

A new set of tools for water use is necessary. The challenge however is getting an industry that is not used to such technologies to use them.

For farmers it is about feel, condition, and experience – technology can be seen as replacing these growers experiences – it is a slow journey. But the key is to identify how farmers can exploit technological changes as opposed to feeling obsolete.

For consumers, they expect that water resources be conscientiously managed. For agricultural and horticultural systems the amount of water is trivial – the financial cost of water is small – the environmental cost however is more significant.

I will be the first to admit that we don't often factor water in as an issue. Water is luxury. There is a low incentive to plan around it. There is however a greater motivation in dryer areas. Consider the obvious differences between water in Spain and water in the UK for example. Technology is more routinely used in Spain because water is more precious.

There is a certain social and psychological attitude to water in the UK that means that despite pressure and awareness building strategies there isn't any buy in from users. There is a resistance to accepting the science.

It is all about cost versus risk. If the cost is comparatively high compared to the risk then it won't be feasible. For soft fruit there have been some steps forward towards precision irrigation and tailoring water to crop demands (these types of products are more sensitive to water quantities, i.e. too much water, so it is more achievable).

The value of water is cheap – equipment is expensive – the longevity of the benefits is not visible. Short-termism is a big problem in this context. Tim Hess' irrigation management ideas are all too expensive for example. And there is a general cavalier attitude amongst irrigators, especially those with unconstrained abstraction rights.

We need a system that is more accountable to water (as opposed to just abstraction).

But for field crops there is likely an irrigation manager responsible for all irrigation activities, likely a luddite, and who thinks that tech is replacing him in his job. So there is a reluctance to engage in technology.

One issue with precision irrigation however is that if run the crop close to supply and demand there isn't any buffer – if the system breaks down what contingency is there? No chance to react.

Another dynamic that is important in terms of irrigation is the relationship between irrigation managers and farm owners. Over irrigation is not visible. Under irrigation however is – think wilting or shrivelling. If this is evident in the fields clearly the irrigation manager is going to have to answer some hard questions even if it isn't really an issue for the crop itself – this is a psychological barrier – particularly where crops are measured in litres of water per kilogram – when it rains water per kilogram is a pointless measure.

What needs to be understood is that water management can be directly linked to crop quality. In that quality can suffer as a result of poor management. It is hard to pin point water as the issue however as there are so many other factors can be attributed to poor quality – this just results in a blame game across different elements in the process. The problem becomes diffuse.

Rainfall can be unpredictable in the UK. There are big risks at play when there is limited water – EA restricts water access, but everyone forgets these once the restrictions are lifted.

There needs to be a general attitude shift when it comes to water – at all levels of the system. It needs to be built into businesses – corporate learning.

If droughts persist, there will be a need for massive infrastructure investments – this will be disappointing for sustainability.

What the system needs is some draconian legislation. Everyone will squawk and moan but it is legislation that works – and the rigorous employment of legislation will ensure it works quickly. Volunteer initiatives can work but they work very slowly.

We must also have a greater focus on how suppliers and retailers behave – what are they driven by? Retailers should really be reflecting the consumers – there is so much NGO awareness raising going on – so consumers are fully aware of the impacts of food. But clearly retailers are driven by prices and margins.

Spring onions as an example are grown in high water stressed areas – Morocco and Egypt. Water can be used for other things there – but it is cheapest to produce onions here – these are the short term market forces that dominate.

Long term sustainability isn't in the picture and there is an attitude of *worry about tomorrow, tomorrow*.

There is also an element of *green washing* which undermines sustainability – it is all the work of elegant PR machines and press releases – buying practices are disconnected from the impacts. It also undermines grower confidence – just living in the here and now.

UK Salad has historically been served by surface and bore hole abstraction and fairly exposed to risk. There would be an opportunity to *build in* resilience through water storage.

It is expensive to do so however in terms of land use and capital cost.

G's had great vision and took advantage of £1M in subsidies from the government to build reservoirs – it is clearly a hard business investment – at the moment they have the UK's most expensive duck ponds.

But at some point there will be drought long enough to warrant them.

Business that can look 10-20 years into the future will have a better chance of surviving – there will be good returns if there is good management but they will have to be brave to put this case forward – it is always tempting to invest in more land than in a reservoir fx.

In the context of processing – abstraction isn't available – it uses mains water and is therefore more sensitive to the dynamics of mains water.

Here there are other issues – affluent and disposal issues, even where treatment is concerned. What type of water is going back into the system?

Water saving methods employed here are by no means philanthropic – it is all about hard cash.

If the cost equation goes the wrong way, everything can change.

It is really important that the social sciences are involved in understanding decision making processes, how accountability is distributed and how change is managed.

There are lots of mixed messages floating around – there are plenty of biases and limited objective assessments – often, how sustainable something is, is overplayed.

There are plenty of uncertainties going forward – Climate for one – but there is a strong sentiment of *deal with it later*.

How well can the system adopt innovations – what types of technologies will play what role...

How will bio-diversity respond? Does it adapt quickly? Or will it be more sensitive than human systems?

How the cost-benefit persists in the industry mentality...

A good example of this is rain guns. These are totally inefficient but they are cheap. It doesn't pay to use something else.

Diesel pumps are another good example. We all know that electric pumps are better – but how many farms do you see with electric pumps... not many – there is no incentive to make the conversion – farmers have invested in diesel pumps previously and can't see the need to change them if they aren't broken... Many are years behind.

So there must be an understanding of investment profiles, what people can afford and how the benefits are presented.

The other dynamics at play – if volume of produce goes down, the price goes up – retailers will be screaming about price wars – pointing to the poor customer in the Daily Mail – and blaming the farmers for food price inflation... There is back pressure on farmers and the retailers look good in the readers eyes... but it is all orchestrated by the retailers.

The price of water could be doubled.

Consumers are using water more efficiently – this will create a greater expectation of the agricultural industry. It can help drive change.

Levying and imported competition or no overseas competition will force the industry to innovate.

Costs will always be reclaimed in the market – there will be nowhere to go. It will balance itself out.

The government needs to ensure that there are significant returns in the market place... China has a managed economy – sure they have troubles but the decisions were made at the government level and now it is better off for it.

But government pressure is unlikely as this will also be on the front page of the daily mail – how the public votes... there is no Daily Mail in China.

The sustainability metric is failing – there needs to be a water metric.

Food is getting cheaper every year – it is destined to fail... what will happen to labour?

There needs to be a better connection with the value of production and then investments should be made accordingly. But no one cares in the long term... it is all about short term gains. No one wants to admit it.

Daily Mail articles about the ALDI basket – the cheapest basket – but what is this doing? 5% of the market cares maybe, but the other 95% don't care at all... they need to be honest.

There are no prizes for thinking sustainably in the industry – you can't climb the greasy pole if you are think long term sustainability – you will probably get fired... And then people are not even really accountable for the long term impacts of short term decision making – people move on – have different jobs etc. Retail buyers are brutal beasts. And the technologists are employed with poor knowledge and experience about the products on purpose – there lack of understanding of how everything works means that they are a) cheaper and b) less likely to make a fuss.

The assurance schemes are bullshit too... they are just check boxes with no value. It is really frustrating. And there is no control.

Herbicide contamination is totally avoidable and manageable – but there is no political will – there should be rewards for using technology properly – but the industry is so fragmented the problems perpetuate and cause unnecessary damage.

Look at Slug Pellets for example ... hard and expensive to remove on the water side – no incentive for investment on the farm side volunteers do it – others don't bother.

There needs to be much for impact from EA – they are more powerful – there needs to be more water restrictions and with more severe climate challenges – the whole industry will have to innovate.

Wholesale

XXXX is part of the XXXX whose mandate is to deal with production, food services, retail, growers and importers – they deal with 100s-1000s of producers around the world – mostly in terms of finished packed and fresh produce.

XXXX Fruit for example deals with melons, grapes, citrus, avocados, bananas, kiwi etc.

In terms of veg. XXXX is interested in specifications of chicory, beans, peas, brassicas, etc. (as the technical development director)

They don't work in apples and pears.

The technical development teams look at food safety, food quality, pesticides, packing, harvesting, etc and measure produce against legislation for food safety and pesticide residues.

They utilise various quality assurance schemes – such as Red Tractor, Global Gap.

This is also an important consideration for the use of labelling – destination, origin, weight, quality etc.

Many of these things including the environmental policies surrounding fruit and veg are set by retailers – min, max size, weight, soundness, scaring, bruising, etc...

Currently XXXX is working together with Leeds University's XXXX to consider different metrics for understanding risk. It is a long term project considering long term climate effects as well as social effects. How might risk be mitigated, how can risk be avoided completely. What is the right data to look at? What would be the best investment? Should we shift which countries we are working with?

If there are going to be any big changes in the UK a business case must be made...

There is always a debate of what the right thing to do is and what the right thing to do is commercially.

Many believe the market will correct itself... cost-benefit – supply-demand – and ultimately it is the consumers/purchasing practices that regulate the market.

ALDI and LIDL have a big role in the current state of the market – loads of produce that is incredibly cheap... other markets have to compete for consumer spending.

This short-termism isn't so good – and the rapid market movements make it difficult to see what the impacts of decision making are.

Without predictive technologies there will always be uncertainty of investment – it is hard to be prepared, think BREXIT and Climate Change – we can't say what is going to happen and at some point

decisions are going to be made based on some sort of data... and this will be held up against relations/history/what has always been.

Even when talking about facts – we are in a situation of being informed and understanding the right version of the truth...

Making decisions based on what feels right – *we'll do business with them* – and then there are tough decisions – *is it viable?* Do we do something together with some one (solving problems together), or do we part ways...?

So building data about the world, think how water is used, distributed etc, it will be important to consider how we communicate and manage how it is interpreted – who is making the decisions, what is happening to growers? What or who is being prioritised?

For the XXXXX – the reason for taking these questions seriously is because the current CEO is interested in long term strategies and feels that these are connected to a greater level of supply chain partnerships.

Farmer

XXXX is a family business that has been operating for the last 120 years – they operate groups of farmers, packers, and their business and marketing operations. They operate over 3000ac of organic land – they utilise some outside growers and cooperatives to fill in gaps in the season if necessary, sometimes importing too.

They have 4 packing and washing sites around the country and Scotland. They employ about 400 people and have a turn over of about £120 million.

XXXX produces 25% organic fruit and veg to match market demands and their business sustainability – the other 75% follows the LEAF accredited practices.

Organic production has been reduced to 25% as a result of ‘funny’ stuff at the retailers end – Sainsbury’s for example have put organic veg prices up by 25% and have slowed down sales there used to be a 10p difference between organic produce and conventional – now there is a 70p difference a price increase which is not returned to the producers – price in the market does not respect the price at production.

There is also a situation where producers are forced to grow too much for the retailers – this is unsustainable – retailers can apply penalties to growers for not delivering – I now have to work out what I am going to do with 970 tons of s... It is a race to the bottom – prices are getting extremely low and retailers can pick and choose what they want from the growers.

Organic farming is also under pressure from retailers by virtue of their food safety policies – M+S is the worst – they will not allow the use of animal manure as a fertilizer and some fields which have been attended to with manure can’t be used for up to 5-10 years following – this is ridiculous. I can understand the concern around salads but through the proper use of compost, and the proper rotation of soil there shouldn’t be any issues. In the worst case UV is used to kill off any bacteria. Using organic matter is important for boosting soil fertility and biology, it is important for water absorption, it is important for the nutritional content of the produce and of course the taste – no one can argue that conventional vegetables taste better than organic.

With respect to water risk/stress you can see how this would play into the favour of resilience – reducing overall water profiles (or at least water wasted) in irrigation and rain fall.

East Anglia is a relatively dry region.

There are a couple of different thoughts about how to manage more extreme drought in the future – lots of people can do lots of different things:

- Farmers just plant what they can water.
- With the right infrastructure more could be grown – i.e. transporting water from the west where there is more rain to the east – this would require engineering and political strategies at a national level for distribution and storage networks – harvesting peak water in areas where there is high rain fall will also help mitigate adverse flooding events.
- Encourage reduced domestic water use.
- Address legacy water licensing issues.
- On farm reservoirs – I have built several reservoirs on my properties – all farmers have some plot of land on their farms that isn't adequate for production – this can be the site of their reservoir. Yes the initial capital input will be high but the value that it adds to the farm, as well as the pleasure value i.e. introducing wildlife to your property will balance this immediately not to mention if you are running out of water... policy can help encourage this with capital allowances and grant aid.
- The big hindrance with reservoirs is the bureaucracy around planning and engineering permissions – traffic, health and safety etc...

Another big water 'risk' for the organic farming sector is the temperature of water i.e. frost, and water available to grow plants/wild flowers that host predatory insects – frost and predatory insects are imperative for organic farming as they manage populations of aphids that destroy crops.

Organic produce can be affordable for everyone with the right levels of professionalism, technology uptake and governance – even where the price of production is properly represented in the market place.

Clearly production will be affected by Brexit and labour issues that will result from Brexit. What will trade with the US be like? Will UK production be exported to elsewhere in Europe?

Govt Rep

Can you talk about what your company specifically does with fresh fruit and vegetables?

Wales grows more potatoes, less fresh fruit and veg, and also has a lot of livestock. She deals mostly with drought and water abstraction, they provide information, advise, licencing, and also have people in the field that go visit farms.

What do you consider to be the main water risks affecting your organisation?

water risks around Pembrokeshire potatoes are not as high because there are already winter storage reservoirs in place - they have been there for quite a couple of years, already in place in 2009, but currently water availability hasn't factored into agriculture decisions much in the past, but they think it should be incorporated more in the future

Why do you perceive these as the main risks?

water scarcity might be perceived as more of a severe risk by here because that's what she mostly works on. Currently particularly with fruit and veg the risk is more on the flooding side though, because the dry weather issue relates more to livestock than veg irrigation. But in Wales at the minute is assessing how fruit and veg might change in the future and so maybe the water risk could become greater in the future.

How do you manage and plan for these risks in your business?

2009 Welsh government produced water resources strategy. Incorporating water planning into agriculture considerations for the future because of the awareness that there are some areas where no water for additional abstraction licenses is available and so planning needs to be done differently. currently there isn't a large amount of irrigation in Wales, but if the decision was made to grow more fruit and veg then more irrigation systems would need to be put in place. Question is whether people will change their farms from livestock to fruit and veg. Currently livestock farms get their water from private supplies (mains), more and more water abstractors who have been exempt from licencing in the past are now being brought into the system (e.g. trickle irrigation) and that might also change things. Key strategies for better water management: have not produced much material on this in the past because it hasn't really been an issue. This process helps the government to understand whether water is used following best efficiency practices because when people apply for licences they need to provide detail and how and what for the water is used. They also produced a handbook that provides advice to farmers on what to do about water when the weather gets dry. Then also provide policy advice to government regarding water management and agricultural policies. Also trying to do better analysis of where geographically there is still water available to be extracted, e.g. in rivers and where licences could be granted or whether licences could be traded. Getting a better understanding of which water catchments are at risk and what could be done about it. Also connecting and learning from new National Water Framework in England.

How far do you currently plan into the future?

Are you able to plan as far into the future as you want (in order to enhance the resilience of your organisation)? If not, why not?

5 year planning cycles within the water industry, and then they also have a long term plan for next 25 years minimum that gets updated regularly. Some companies even look out to 2080-2100.

If the impacts of a water-related risk go beyond what you have planned for, what would happen in the short term, and what would happen in the long term?

what's the ideal resiliency outcome you're aiming for? Recognition of the need to bring in water users into long term water resources planning. Better understand need of water users outside of water industry. Also analysing how more strategic sources of water and respective infrastructure could be developed. Objective is to become more resilient to dry weather events and respond to longterm water needs.

Are there any other strategies for increasing your business's resilience to these risks that you can think of?

no drought plan yet, but working on this, identifying which actions they should take when a drought occurs, currently also going through lessons learned from the dry summer, that will lead to a set of actions and changes for the future, particularly around how to bring agriculture into planning for droughts

Now thinking about the fruit and veg supply system as a whole, what do you think should be changed to increase its resilience to water risks?

doenst know a lot about supply chain and cooperation, but farmers have certain unfavourable behaviours regarding water practices because they need to meet contracts - some of the short contracts that buyers issue can have quite an influence over farm practices. For certain farms there is a requirement to actually have access to water through the mains supply for dry periods and so there is already a linkage to water companies, that can be quite costly for farmers.

Is there anything that really should not be changed?

usage of winter storage reservoirs has been really good and helpful this summer, and so this could also be good in the future

Producer Group representative

Can you talk about what your company specifically does with fresh fruit and vegetables?

consultant providing support to the ornamental industry mainly but also fruit and veg growers, help comply with legislation and make applications, communicate with EA, also provides technical support to XXX, represent ornamental industry's views and requirements in several government areas, i.e. water for food group and abstraction group, national drought group. So represents protected crops and container crops and field-grown ornamentals in legislative processes. Does that in all of UK.

Which other businesses and organisations does your company interact most with

Growers, policy makers, etc. Does not work too much with actual packers, but with large garden center chains and plant selling chains. Also input into British Retail Consortium. Involved very little with non-ornamental producers, but does include fruit growers.

Which other businesses and organisations in the supply chain affect your business the most?

Buyer mainly say what they want to buy specifically and then growers will respond to that, there's contracts set up for all of these - so buyers (retailers and others) have a lot of influence over growers. Relationships with retailers are generally good, but forced and there are unequal power balances in that - they can very strongly dictate the market and it's hard to change this to a different system.

What do you consider to be the main water risks affecting your organisation

In container industry that includes most berries, much dependency on water (on 24h basis) - e.g. strawberries get irrigated 10 times a day for a short time and this is absolutely necessary. So irrigation always has to occur every 24h so that the plant doesn't get damaged/wiped out. Having a continuous and reliable source of water on a 24 h basis is the most important thing for container growing. More resilience out in the field because there is more soil moisture surrounding the trees and they have large root networks. But you get a serious reduction in tree growth if there are very dry conditions. Mature trees don't tend to die but young trees can die if there are severe droughts, they don't have good roots yet so less resilience. Drought affects fruit size, flowering, branch size, the whole of the tree quality.

Why do you perceive these as the main risks?

Heavy rains and floods are also bad risk for container growing. For trees not so much of a problem given that the water doesn't stay longer than 10-14 days - flooded field crops will survive that. If a flood takes longer than that, there can be severe damage to the root system. But then there is also the risk of soil erosion which can be a problem in the field. In general, in the UK in the past 10 years growers had to deal with heavier rainfall sometimes instead of more constant light rain and also more drought, so both incidents are occurring more frequently. Microbiological contamination: is certainly a factor that berry growers need to look out for and they need to treat water and sanitise it prior to crop application because they are consumed raw. On field level it is usually relied on UV of sun to sanitise water. So this is not a really crucial risk as such because it is being controlled and managed well.

How have these risks impacted on your business in the past?

Impacts this summer from the drought: problems with lifting field grown crops. Sugar beets, carrots, parsnips etc. the soil is too dry so you couldn't lift the crop to harvest it, so irrigation had to be applied to moisten the soil to lift the crop to get machinery in, so that required an extra amount of irrigation compared to a normal year. There have been impacts on profits as well, because cost of lifting the crops have been much higher than normally expected, more diesel, more time, more water etc involved, but it's difficult to quantify. Also, many people had already used up their irrigation licences and needed to apply for extensions, legislative work needed to be done to make this possible. EA was prepared to receive such requests. A fair amount of lobbying of senior EA staff was required so that they would understand the need and the problem to facilitate this process. Conditions are better for growers who supply to open market and food services, they pay better. In ornamental horticulture sales to independent garden centers are also much better.

there is a move and government encouragement towards winter storage, and also ability to take excess summer water and store in reservoirs. These practices are increasing. These are good for broad acre agriculture, but for nurseries etc. it's more difficult because they don't have large land areas available for reservoirs. Much of the nursery industry is dependant on groundwater extraction. Irrigation systems are highly advanced and use moisture sensory techniques to automate irrigation times and frequencies. As 80% of our food is grown by a few large producers that make up 20% of the farms, most of these would use such advanced techniques. Other smaller growers might not use such advanced technology. at least 60% of protected crops now also use rainforest harvesting or water recycling

How do you manage and plan for these risks in your business

How far do you currently plan into the future?

not as much long-term planning anymore, because growers just need to respond to buyers' interests and short-term (yearly or so) contracts, but growers think about 5-10 years ahead when planning irrigation investments and more general farm things

Are there any other strategies for increasing your business's resilience to these risks that you can think of?

No, and there shouldn't be because they don't have high impact anyways, other sectors use much more water

What would need to change for these alternative strategies to be implemented

We should remember that agriculture extracts less than one percent of total water extraction, but it is taken as a very demonstrative sector, so the work that's needed is that people need to appreciate that food is an essential water need, production of food needs water, no food without water on the plates. So government thinking has to change in the way that people don't think anymore that irrigation needs to change so that agriculture uses less water because agriculture already only uses 1% or less of abstracted water. So there needs to be fresh thinking as to the allocation of water to the environmental sector. Every abstraction systems - power generation, public water supply, irrigation - everyone is asked to reduce water requirement, but environmental sector has no constraints and can do whatever it likes. So we need to restrict environmental use of water to allocate more to the essential uses of water such as food production. Environmental sector means just environment/nature and conservation. We need to assess better how much water nature really needs and how much more could be taken away

Now thinking about the fruit and veg supply system as a whole, what do you think should be changed to increase its resilience to water risks?

Food production does not lie high enough on the preference thinking of the government in terms of water allocation. financial availability of sufficient funds to invest in reservoirs for example, a degree of uncertainty in terms of future cropping, altering climate conditions due to climate change, so people are trying to become more resilient to extreme conditions such as more frequent droughts and water excess events

Reservoirs and reservoir cooperation between farmers wouldn't be helpful for nurseries because they don't have land and they are very dispersed so couldn't really cooperate with each other. Cooperation between nurseries and water companies for reservoirs and such are also challenging because generally mains water is too expensive. The problem is the proximity of water, it's heavy and resource intensive to transport. So only reservoirs that are in close proximity to water treatment plants and so on can really cooperate with water companies, otherwise it might be too complicated. In general, the most important thing is for the environmental sector to tighten its belt and make more room for other sectors' water use.