[Project introduction]

Int: How many years farming for?

M: That'll show my age won't it? Well I'm fifty this year, and I've been farming really I suppose since I was born here, so I've been involved with it as a family business, when I was able to walk outside and help my father with the cattle, so when do you say actually did I start farming, because at 5 years old I was out helping father feed the cattle and catch the chickens and yeah, from about 5, so it's a lifetime really. But then I went off to University and agricultural college and did a post-grad. Then came back home and then did some more training. I mean I've been here, I've been doing agriculture since I can remember. Certainly since I left school, I've been farming, you know, my first job was here, you know, my last job will be here.

Int: And how long did your family have the farm before you were born?

M: My great grandfather bought the farm here in 1927, so I'm fourth generation.

Int: And what's the total size of the farm, and what's the cropped area?

M: Well, that's an interesting one because we are contract farmers. So we farm for 27 landlords and we are farming over 5000 acres (1200 Ha), of which we own about 1000 acres, by the family, family own that. [redacted] So I suppose my side of the family which I'm responsible is 750ish acres, farming about 5000 for lots of other people. [redacted]

Int: So at what point did you start contract farming?

M: That was started by my father, he was one of the first people in this area to start. Probably soon after I was born in the sixties, late sixties, early seventies, he started contract farming, and yeah, it's growing.

Int: Was that because it was not profitable for people to farm their own land anymore?

M: Well, it's a matter of scale really. What we find, of those 27 people I'm farming for, some of them, their children didn't want to go into agriculture but they didn't want to sell away the family jewels, the house, the land and what have you there. Sons and daughters are going into the big smoke and earning lots of money as hedge fund managers in London, and bankers and lawyers and solicitors. There's those types. There's also the type where the people that own the farm are getting old and they think, "I can't really cope with all this now, I've got all this ploughing to do, I want someone to help, to ease the pressure". We do a lot of that because people are getting older and they can't do it themselves. And the other one we do is widows whose husband was a farmer and died, or the other way round, and therefore they've got kids to look after.. it works both ways.

Int: And do all the places that you farm have water available? How does it work?

M: Some of that... I mean I've got 7 sites where I abstract water from, not all of them do have abstraction licenses, but very often they are a close neighbour or adjoining, so I can use water from one place and pipe water over the road to the other place and utilise it on other estates, I do quite a bit of that. Some of them I can't, some of them haven't got any water and I have to grow without any water. So a bit of a mixed bag there. But 7, we look after 7 anyway.

Int: Okay, but your basically in charge of organising the water?

M: And that's the other thing I didn't highlight, the reason why a number of these people have said, "look, please can you take this worry and stress of farming this land on Mr [redacted]" is because they don't want to cope... they don't want the hassle of all the paperwork, all the regulation, all that sort of stuff really binds people down and tires people, "oh no not something else we've got to do", and you see I've got an office next door with 3 people in it, sometimes there's 5 people next door, there isn't many farm offices with 5 people working at computers and what have you, and the reason I've got such a big farm office is not because I'm a big farmer, because you can do farm office work with one person, but it's running 5 businesses. There's two butchery businesses , there's two consultance businesses, there's a farming business, so there's a number of businesses running, it looks a bit odd, but you know having a big office like this.

Int: It sounds complex.

M: It is complex, yes.

Int: So

M: I can also talk the hind leg off a donkey

Int: It's good! We'll get a lot of words in. So in terms of the land that you own, is that all irrigated?

M: Yes. Mmm. Yeah, I would say all the land we own we can irrigate it, but not all with our own irrigation water. I've got some land that we own that is owned by our pension fund where we borrow water from a neighbouring farm. We can irrigate, but some of it comes from another supply to irrigate it, but the main block, yes I can irrigate all our own land.

Int: So it sounds like you have to maintain lots of different relationships with a lot people to be able to run this type of business at this scale?

M: Yeah.

Int: It must be a case of having to juggle a lot of things.

M: Yes, you do have to juggle, everyone has their own agenda and it's about being good with people, and talking to people.

Int: So what water sources do you use?

M: Right, the irrigation on this farm, and I'm talking globally here about everything I crop, we have wellpoints. Do you know what they are?

Int: Is it different to a borehole? No I don't.

M: Lots of people don't know what well points are so I'll just quickly tell you what they are. Wellpoints are lots of little wells, they are 2.5 inch pipes, about 30 foot into the ground, sunk down, tiny little things right, with plastic pipe pushed into the ground with slits in the side of it. Generally into a wetty sort of area, an old meadow that's a flood plain or a water meadow. Push these pipes down with slits and of course the water goes into the slits. So the pipe fills up with water. Then what you do is you put a top pipe all the way along to join lots of them together. In the case here of [redacted] farm we had 35 joined together by one pipe at the top, sealed. And you've got 35. So then what do you do?

Int: Er, lift if up and pour it out?

M: Sort of, create a vaccuum. So you then suck all the air out of that top pipe and create a vaccum and taking the air out, you are drawing it up, it's like sucking up a straw, and all this water comes out of 35, and you then pump it, once you've sucked the air out it brings water up, pump it, boost it, round the farm. So that's a well point system, so we've got two of those.

Int: So they are suitable in areas where you have relatively waterlogged ground or quite a high water table?

M: Well, you are in the [redacted]

Int: Sandy soil?

M: And water. We've got more water related SSI's and SACs, RAMSAR sites, you name it, we've got it here in [redacted]. [redacted] is a wet area, it's quite low-lying, it's undulating, but it's a lovely part of the world, but it takes people a long while to come into [redacted], you know, from here it takes me an hour to get out of [redacted], and it's a wet area. And it's light land, or loamy soils, and a wet area. [redacted] little lakes, interlinked with rivers, and it's a wet area, so you don't have to go down too far to get to water. So when you have a flood plain, a water meadow, where it's too difficult, it's too wet to crop with any sensible arable crop, it's generally in grass for sheep or grass for dairy... lots of grass in [redacted] actually, although it's increasingly disappearing, but those wet areas are ideal for sinking these wells in and there are a lot of well point systems, irrigation systems around [redacted]. So that's one type, which we have two of. The other type is a deep bore, which you'll be much more familiar which is a big hole, sunk in the ground with a pump down the bottom, has power going to it, pushes the water up, gets to the top, the top pump then, another pump, pushes it round the farm or you can have one really big motor down in the well that will just pump it up and round the farm as well. And we've got one of those. Actually, deep bores I've got 1,2,3,4 of those, and the other one I've got is a reservoir, but the reservoir is not mine, it's on a farm that I crop potatoes on, it's near [redacted], it's a big reservoir, and they harvest water through the winter months out of a stream or river and then summer months they pump out of their reservoir round the farm with a floating pump on the reservoir.

Int: So you don't have any actual surface water?

M: I don't, I don't abstract from a river.

Int: So you have licenses for your boreholes

M: Groundwater, I think wellpoints and deep bore are both classified as groundwater. No surface water, it's a bit of a grey area because wellpoints they don't go very deep, they are only going 30

foot. And how much of that river water leaks down into that well? So that's a bit of a moot point. But generally as the EA goes it's groundwater, not surface water I'm not sucking it out of a river.

Int: And so, you don't have any reservoirs of your own, so basically your are reliant on groundwater, and your licenses, are they time-limited?

M: Some and some. I've got some time limtied up for renewal this year, which I've applied for, and we are having a lot of hassle in getting them renewed. A lot of problems. They want to cut each of my three licenses, they want to cut them by 25%. Which will have a major impact on what we can do with cropping, reduce my potato acreage by 25%, that's a big hit.

Int: On what basis do they want to cut them?

M: Because there's a thing called [redacted], where they didn't want, and they've got a chap by the name of [redacted]who wanted to stop his local farmer irrigating, and he tried to stop the local farmer having an irrigation license, and [redacted]... there's a huge massive bit on [redacted] if you want to google that, basically the EA wouldn't let him have a license, it went to judicial review, court case etc, judge and basically they said that they found I think it was a 0.01% reduction in the level of sphagnum moss in a SSSI, that was affected by his water abstraction and 0.01% reduction sphagnum moss stopped this guy having his irrigation license, and that's why the EA are now reviewing all the licenses in this catchment big time. And I can give you a paper on it I think if you want me to.

Int: And are you satisifed with the way the EA are assessing environmental water requirements?

M: Er, I think the EA are leaning much much more on the precautionary principle now, having gone through [redacted] in this area, the precautionary principle is becoming a real problem for us because it's so precautionary, that actually they daren't do anything and they are looking at the environment all the while, and that is causing a problem for us as abstractors for agriculture. Agriculture is very much pushed aside because the environment has got to come first and they don't do anything because of the er, yeah, precautionary principle problem.

Int: So what options are there for you if your license was reduced by 25%? Would you just have to take a hit or are there any ways in which you can restructure?

M: I would have to restructure things not to have so many potatoes, and it would probably restructure the farm completely, I would reduce my labour, I'd have to get rid of some staff because I wouldn't need all those staff because I've got less potatoes, I'd probably do more myself, less employment, less production, a huge effect. And I mean, I don't know, but that's the way I'm

looking at it at the moment, because labour is expensive, machinery is expensive and I'd have to reduce that. If I can't grow the crops which produce the money which are things like potatoes, carrots and things that need water... if I haven't got the water to produce it I can't guarantee that I'm going to get a crop and I'm going to have to cut back. And that will have a significant impact on agriculture in this part of the world. I'm not alone.

Int: And in terms of the places where you go and contract farm, is there anything that guarantees... as in do you go back to the same farms every year or does it change on a yearly basis?

M: No, I don't, I go back... these are long term arrangements that I've built up over a number of years. I go back to them every year and crop with them, but obviously, on their farms, cropping potatoes... there's two different ways of doing this... there's two different styles. On a couple of farms I just grow potatoes on their farm, and they are big farms, they are several thousand acres themselves, so I'll just, every year I'll have one farm, I'll have a hundred acres of potatoes, and those hundred acres on his 2.5 thousand acre farm, go round rotationally round his farm, and I, every year, have different fields. And some of that's virgin land, never had potatoes on it and he's got a brand new irrigation system, he's the guy with the reservoir and it works very well and I don't mind going over there and I like him lots and he used to work for me and it all works. The other system is the farmers that I farm the whole farm for, where I treat their farm as if it's my own, and potatoes come into the rotation as they would in my own farm. So once every seven years a field becomes potatoes. And we tend to try and extend that rotation as much as possible, it's currently 1 in 7. I'd like to push it 1 in 8. And those years when the potatoes, they use the water. We don't just use the water on potatoes, though, we sometimes use it on dwarf beans, sometimes on sugar beet, um early in the season we have been known to use it on cereals. But it's a bit expensive to use it on cereals, wheat and barley, we have done. But other crops utilise it a lot more better! My English wasn't very good there.

Int: So are all of those places where you do contract farming at risk of losing 25% of their license as well?

M: Those 3 I'm saying to you, you asked me and I didn't complete the question did I. I've got three in for renewal which are three of my contract farms, where they are time limited licenses. Some of my contract farms another three or four of them have got permanent licenses where they don't come up for renewal. And some of them have already gone through that renewal. My licence here was renewed 2 years ago. And this is the funny thing, they looked at my licence, here I'd applied for a variation to go from the wellpoints to a deep bore, and I've still got the wellpoints licence with a variation to take exactly the same water from a deep bore, which goes down into the chalk, about 85 metres down, exactly the same amount of water on the licence, and they've gone for that until 2030. Time limited until 2030, so I haven't got to do it again until 2030.

Int: Is that normal?

M: Yeah.

Int: So they are not really reassessing things very often?

M: That's normal for some licences. The ones they are now doing I think I'll be lucky if I can get 5 years or 3 years or 7 years... I don't know. But they were 2 years ago, in 2015 I had a licence to 2030, which I'm very pleased about, thankyou very much. So I'm alright here mate, but a lot of my farms that I farm for are not alright, they are looking at actually maybe an annual licence. I don't know what will happen.

Int: And how would that effect the sorts of choices you might make in your business?

M: Oh huge.

Int: If you have a licence that's like for 30 years, how would that affect your choices about agricultural water use, against a licence that was being renewed every few years.

M: Oh huge. Because if I've got 30 years I've got some confidence that I've got that water for thirty years, and therefore I can make an investment in the business. If I need a new potato store I can think about building a new potato store. If I need to invest in some machinery, or some pipe to go down underground or whatever it might be, some extension to the underground main... whatever it might be I can think about investing it because I've got the security of knowing that water is there. If I've only got a licence renewed for 2 or 3 years that doesn't give me enough, because potatoes is once in a seven year crop, and potatoes is what I do mainly, and that's the bit of the business that actually is doing alright at the moment. But if I haven't got that security I'm not going to invest in new irrigators, new machinery, new ways of doing things, better this, better that. Because I wouldn't have the confidence. So yeah, huge.

Int: So what are your main ways of applying irrigation?

M: Booms and rain guns, but I've gone more to booms over recent years because I'm growing way more salads which don't want big heavy lumps of water, so mainly booms now.

Int: And which do you think is a more efficient way of applying water?

M: Booms. Oh the most efficient way is obviously a centre pivot, but I don't farm in an Egyptian desert where you can just sink a hole and put in a bloody great centre pivot rivet. And I can't do

lines and things like that, just it doesn't work here. I've got lots of little fields. My average field size is under 20 acres. I've got seven 7 acre fields, three 3 acre fields, a two acre field, you know it's an enormous patchwork of little square bits. So I have to find something that fits the system. We moved to 72 metre booms because they work and they are more efficient and we get quite a lot of wind through the summer months when we are irrigating here in [redacted], because we are quite coastal, so the wind keeps the water roughly to the right area of the crop that needs it, so it's more uniform on that crop. Rain guns can, if you get heavy wind over night, it can push all the water one way and then your crop's not irrigatied precisely enough, and also it can blow it on the road and cause more problems with local people complaining that something's gone over the hedge and got their car wet or... So irrigation booms are much better because they fit the system but it doesn't fit all fields because some fields have got telegraph poles and electricity pylons and things and in those situations where you've gota structure or something in the way you then have to think about using a boom that will come past the structure and the water will either go through the structure, hit the structure and not matter or... So horses for courses.

Int: So there are limitations on what you can do in this area.

M: That's why I've got mainly booms but I've still got rain guns because rain guns have to do some of it.

Int: And how do you schedule your irrigation?

M: We use [redacted]. We tell them at the beginning of the season what crops we've got, what varieties they are, where they are, and then we go out and do a, as soon as we've planted we tell them the planting date, we tell them the emergence date, fifty days after emergence we start doing a canopy cover with a square grid to see how many leaves on the grid and do a canopy cover.

Int: So what's that done, from a satellite or...

M: No, by hand.

Int: Okay

M: It's a metre by metre square, or near enough, and it's got bits of string going between to create lots of squares and you hold it over the crop and you count how many squares you are looking through have got a leaf and you can then work out whether that crop is 30% ground voer, 40% ground cover, or 100% ground cover, because it's all green.

Int: So you do that to a proportion of the field?

M: Yes, you go and do three of those in each field and then take an average, and I send a man out to do that and whilst he's there doing that, testing the ground cover of the crop, he'll test the rain gauge in the field to see how much rainfall there's been. We know how much water we've put on the field because we record the irrigation that goes to that field when we go to the pump as we read the meter how much water's gone down the pipe to that field for that crop, that's all recorded, so that's how we do it, we send the information off to [redacted] and they run their service that we pay for and he'll come back saying, "you need to irrigate that field again in 5 days with another 20mm or 15mm and he'll give me a recommendation.

Int: And do you do anything else like use probes?

M: I have used probes, we used some last year, probably going to use some this year, neutron probes, I've used those last year on a field and got some quite interesting data from them, and I've also got an ET gauge in my garden which every morning I come out and look at the ET gauge to see how much that's gone down, what the evapotranspiration has been, and that's quite interesting to see as well. And some of its gut reaction, some of it's going out into the field with a spade and digging and seeing.

Int: Because it must be difficult to get around to all the different fields that you are farming... is it covering quite a large area?

M: My furthest field would take me just over half an hour to get to.

Int: Okay, so it's not impossible, so you'd be trying to get around once a week in person?

M: Once a week. But I don't do it in person, I employ someone to go round once a week. So I send one of my guys round once a week who knows how to do the ground cover, do the rain gauge, and he'll bring the information back for me to put on... because I'm a bit of an office wallah, I spend far too much time in here crunching paperwork, that's the sort of farmer I am. I sit in front of that screen far too much. I put the information on an excel spreadsheet and send it off and what else was I going to say about that? Oh yes, I also get a lot of information from the likes of [redacted], but also I've got my own agronomist looking at the crop, I've got an agronomist from the people I'm growing for looking at the crop, so I'll have a branston agronomist looking at the branston crop, I'll have a [redacted] agronomist looking at the [redacted] crop, I'll have a [redacted] agronomist looking at the [redacted] crop, so all these people are looking at the crops and they are all just feeding into me, and I'm just basically the server. I take information from whoever inputs it into me and then I just push it to wherever.

Int: You must never get to have a sick day ever.

M: No, I don't!

Int: So are you growing for contracts or for...

M: Everything is on contract.

Int: So 100% of what you are growing is on a fixed price contract, and is that going to supermarkets as fresh?

M: All sorts. As I said, Mcain's is processing for chips, I grow chips for others to and processing (yawns), excuse me, I also work at night, as well as in the day. Salads for the supermarkets, and potatoes for crisps. So they are all on contract.

Int: So do these different customers influence your water use or try to influence the type of irrigation equipment that you are using? Or anything in any way?

M: No. They don't. The only effect that they have is that they demand that their crop is irrigated. You wouldn't go growing a high value crop for them without irrigation, that's the only demand they've got.

Int: They don't specify anything about which irrigation type you should be using?

M: No.

Int: In terms of some of the accreditation schemes, do those impact on your water use at all?

M: No, they don't impinge on my water use at all... no. No I don't think they do. Not a problem. Here we are leaf marque, we are red tractor and that's now includes nurture in there because Tesco's have recognised that red tractors is the same standard as nurture. So before we were, if you see up there we've got Tesco Nurture up there, we've got Red Tractor and we've also got Leaf Marque. [redacted] next door is working on my audits for me. They require us to test the water to make sure it's of good enough quality, which is fine because it's coming out of the ground deep down in the chalk and if that ain't right then there ain't much going to be. But they still need to check that there's no bad levels of things there shouldn't be, chloride, iron or whatever it might be,

so they are doing that for the assured produce scheme, Tesco Nurture, and actually, some of those schemes pay me more money because if I'm Leaf Marque, which I am, my potatoes are Leaf Marque, I get paid more as a premium because I'm a Leaf Marque grower. So they can go to M&S, they can go to Waitrose, because I'm a Leaf Marque grower, whereas if I wasn't Leaf Marque, they couldn't go there, and that's a premium.

Int: Thinking about a year where you didn't have enough water... I guess it doesn't happen very often with groundwater, are the levels ever low? Have you ever been told not to irrigate by the EA?

M: We have been in situations where we are put on what they call a section 57, where they say, "Please be careful, we are running out of water, and we are thinking about standpipes in the village and that sort of thing". So it doesn't happen very often, but it has happened, and we know about that very often before it's coming and we take mitigating measures early on which are things like only irrigating at night. Perhaps being more careful about not giving the maximum amount of water the crop needs to progress, maybe cutting back a little, so the crop is still surviving and getting on but probably not getting quite as much as it should do, so tailing it back a little bit. But that's not good because that affects the yield. So you don't want to stop it because if you stop it then you get problems with the growth of the crop, skin finish difficulties etc. But you might cut back a bit which will reduce your yield, so you'll still have a crop, but you might not have quite so much of a crop as to meet your contract.

Int: So in circumstances where due to a lack of water or too much water perhaps...

M: Mmm, we had too much water a couple of years ago. A crop of salad potatoes which was a very wet June, and a very dull June, and that crop did not like the wet dull June, and they ended up with lots of skin splits and cracks and I ended up with a whole load of salad potatoes with cracks down them, and they didn't want them in the supermarket, people would go like, "oooh, they look horrible". They were, and basically it was a right off.

Int: So what happened in terms of the contracts? The supermarket presumably didn't pay you, but did they?

M: They took them all, they had a contract to take them and they took them.

Int: Okay, so you weren't penalised in any way?

M: No, I was penalised on yield, because we lost quite a lot grading them out. I got my staff to take when they were picking the potatoes out to get as many of the cracked ones out as we could, so we

lost on yield for that, we lost on yield because the crop didn't like the dull wet June, so we lost in yield, but we didn't lose in they wouldn't take them, they still took all the potatoes.

Int: So they took them but you weren't giving them as many as they had wanted, and what happened them did they charge you for purchasing them from somewhere else or...?

M: Some and some. Some companies did and some companies didn't. So, I'm not going to tell you which was which. But I did have some companies saying, "we know it was a bad year, hard luck, we'll pay you what you've got, thank you very much". Some companies said, "it's a bad year, you haven't supplied the contract, you have to make it up. This is what it's going to cost you because we've had to go out to the open market and buy them and the potatoes are very expensive" so we had a bill. So a bit of both.

Int: The supermarkets that pushed the cost back onto you, they didn't...

M: Stop there, I don't actually trade with any supermarkets. I supply processors and packers. So the packers I supply pack for Tescos, Waitrose, etc. I supply Branston, Branston supply Tesco, Waitrose, Marks and Spencers, whoever they supply, they supply lots of people. But I don't have a contract with Tesco, I don't have a contract with any of the supermarkets, I'm all through an intermediary. So Branston I have to say were very fair, and they said, "bad year". They took what I got and that was it, no problem. I'm not going to tell you what the other one was, but I had the other one, who was a processor, who took my potatoes to make something with and I couldn't supply because it was a bad year and he said, "that's going to cost you XY and Z, so you'll have to pay because you've got a contract". So it happened both ways.

Int: So looking at the system, when you have a bad year because of water or environmental conditions, sometimes the risk of that is borne by the farmer, you are covering all the costs of that, so you are not selling as much, but you also have to make up all the costs for the intermediary, and in other situations it would be that they might not penalise you. But going onto the retailers, do you think the retailers are bearing any of the risks or costs?

M: No.

Int: Do you think that's sustainable in the long run?

M: No.

Int: Is there any other way to do business?

M: No, because they are all powerful. The supermarkets, they are the god. They are the ones that make the rules and break the rules and do what they want, to be honest with you, and you can't control them, and yeah. They make all the nice noises about... Waitrose will say for example that they want to support the British farmer, "And all our produce is from Britain and low food miles and sustainable". They want to say all those lovely words, but actually they'll be the ones that will go and buy asparagus from Peru, bang in the middle of the asparagus season in this country, and you walk into the local Tescos and my cousin is an asparagus grower, just 2 miles down the road, he produces no end of asparagus. Waitrose there, less than 5 miles and you look on the shelves... Peruvian! And he supplies Tesco, but he supplies Tesco around the country, but doesn't supply the local supermarket. And what the hell is going on? It's wrong! And Waitrose will say, "yes, but we have to guarantee...". What they can't do is they cannot not have asparagus on the shelf. They cannot not have potatoes. Because consumers like you and me, they need to go to Waitrose every day and get strawberries, raspberries, asparagus, potatoes, they cannot not have them on the shelves. So they will tell you they have to buy from Peru to guarantee supply on their shelves. So, the English season for asparagus is very short and they don't produce asparagus in January. They also don't produce asparagus in September. But the consumer wants to have asparagus in January and September, so it has to come from round the world. That's why, and the supermarket has to supply it.

Int: So do you think consumers take any interest in the agricultural water use and any environmental effects of their consumption habits on water elsewhere?

M: No. I don't think they do. To be honest with you. I mean I may be being very unfair on the consumers here, but I'm thinking that Joe Bloggs who lives in London, really all he's interested in is food that looks nice, is cheap, and tastes nice. He's not interested in where it's come from. He's not interested in how it's been produced, really. If it's an animal, yes. If it's an animal, the London set, more particularly than any other part of the country I would say, and I might be wrong on that, but let's say London for example. If it's an animal they are more interested in how it's been raised, where it's been raised, how it's been looked after. And lots of that has happened because of the Tesco scandal on horsemeat. But when you get down to a potato, I don't think they really care whether that potato comes from [redacted], Scotland, Wales, or whether it comes from Spain, Egypt... you know they don't really care... they know the difference between red and white because they can see the difference between that, but if I put a salad potato in a bag and say that that variety is Piccolo Star, oooh, oooh, "no it doesn't say Charlotte", and if that salad potato said Charlotte, "ooh, they're alright, their Charlotte". "Piccolo star, ooh I don't know about them". Very very hooked up on names, and I'm sure you are too, if I asked you to name varieties of potato, I bet you would say to me, you'd come up with Charlotte, you'd come up with Maris Piper, you'd come up with Estima, you'd come up with King Edward.

Int:I don't know if I'd name that good a list! I'd come up with pink fir apple because I've grown them.

M: Well, they are salads, so well done. But most people don't really know about varieties, they just want something that looks like a potato, is a potato, and cooks nicely. And generally the housewife will go for Maris Piper, because they've heard the name, and if they want salad they'll go for Charlotte, because they've heard the name, and they want it cheap. They don't want to know about where it's come from. It's price and it's name. And that's the sad thing, because actually, better varieties for tasting, if you want to have a good variety of potato and you ever go and look on the fresh produce shelf, the best variety on my book for eating general purpose, Maris Piper equivalent, is a variety called Daisy. Does chips, crisps, everything. You can do everything with Daisy, that you can do with Maris Piper. It's a fantastic tasting variety. And the best flavoursome variety of salads, I would say, is Piccolo Star.

Int: So thinking about the food system we have retailers being driven by the need to give consumers things at any time they might want to buy it, consumers not really interested in agricultural water use, not really interested in the environmental problems of their food too much. So how can we increase the resilience of the system because at the moment we are using vast amounts of water in other parts of the world that are a lot drier than the UK...

M: Spain.

Int: And that's surely not very sustainable. So how can we get change in the system and who might be the right people to drive change in the system?

M: Good question. I would think personally it's got to come from the supermarkets being more responsible for global sustainability, at what they are doing, why they are doing it, and saying to the consumers, "sorry, heaven forbid, but sorry, there is no asparagus" because it's not in season. They are going to "ouch, that'll hurt, because we can't sell asparagus". But you only have to go back to last year, when there was a shortage of lettuces, because Spain had got a problem, and that will happen again. And lettuces were like ridiculous amounts of money to buy a lettuce because they were so short. And the lettuce scare of last year is just an education that'll happen more of. How are we going to get around it, or what's caused it? I think it's got to come from government, and I think one of the big problems that has happened over the years is education, and what I mean by that is that governments have stopped domestic science, it's no longer on the curriculum. There's no o-level or a-level in agriculture or anything like that. They are now talking about it, it's now becoming part of the debate and there was a question raised in the commons recently about putting back an O-level in agriculture or something like that, I can't remeber exactly. But it's about education of the next generation and that comes from Government, because the government has done away with food science, it's done away with agriculture, it's done away with domestic science, and all that's gone out of the window. So the only things that kids are taught now is pure science, physics, maths, english literature, art, sports science. There's lots of sports science, lots of people doing physiotherapy and sociology and psychology, but not alot of people doing food, and how it's eaten, how it's grown and how to cook it. Because sorry I digress, but it just amuses me, my business when I look back, when I started growing potatoes here we were growing mainly for crisps and then we introduced chips. Now over half my acreage is salad potatoes which are much higher

value. Little, tiny little things. And the size of my salad potatoes, the requirements for the people that I sell them to, the packers, to go to Tescos and Waitrose, is getting smaller and smaller and smaller. They used to be under 45mm. Now that's about a 45 mm potato. The size of potatoes that people want to eat as salads now are smaller every year. They now want salad potatoes that size [gesturing]. That's difficult to lift because when you are trying to get potatoes out of the ground that small, there's lots of them and how do you get them from a harvester into a field, into a box, they fall out of the bottom of the box, they fall out of the machinery, but they want them that small. Do you know why?

Int: No...

M: Well, the reason why the consumer, the way this country and the population is going, it's all about speed, convenience and eatability. What I mean is that smaller potatoes take less time to cook, so we've all go busy lives, you've got a busy life, I've got a busy life. You just put them in boiling water on a cooker for 15 minutes and they are cooked, or put them in a microwave in the pack and they are cooked. But not only that, the reason they got smaller and smaller and smaller is people eat food, now, on the go. So a potato that size requires one implement to eat it, and that's a fork, you can pick it up and put it in your mouth. Whether you are sitting in front of the telly having a lounge supper, on a plate in front of the telly, or whether you are on the move on a train, you can fork, mouth, fork, mouth. People no longer want to use two implements. The knife is gone. It's true. Because a human has got to go through, you've got to have two implements, you've got to sit somewhere that's rigid so you can carve or cut, and it's an effort to do it, so why would you want to use a knife. You want to use a fork, so fork-mouth, fork-mouth. That's why it's getting smaller and smaller and smaller.

Int: And so what is the water difference to produce smaller potatoes. Does it mean you use less water?

M: I think it probably does, we are using less water because growing smaller potatoes the crop isn't in the ground for so long and therefore it doesn't need to be sustained for so long, and it's more intensive whenever we are doing it, it's more little and often, instead of dumping on an inch like we used to do twenty years ago, put an acre inch on. We now don't, the maximum we now put on is 20mm and with salads, very often we are putting on 15mm and we are going more regularly, it's not just once a week, in the hot dry summer, in the middle of August, we might be going every 5 days, with 15mm to keep up the water, but still, the because they are not in the ground so long we are using less water because of that. Because the crisping and the chipping boys. The crisping boys want potatoes that are long and thin and they take much more water to grow those, so yeah we are using less.

Int: And would you be considering using trickle with salad potatoes?

M: No, you wouldn't, not appropriate with salad, because you are in a bed, three rows in a bed, trickle systems work well when you've got two rows and you can put a trickle tape down the middle and it leaks and water goes to those two rows, but you can't put trickle very easily down the middle of a central bed because the potatoes in the middle will get all the water, the ones at the side won't get the waterand you end up with two different types of potato, and that's what you don't want, because you want them all uniform. So for trickle irrigation for salads, I don't think is really working.

Int: So what do you understand by the term irrigation efficiency? Can you give me your definition?

M: For me, the definition of irrigation efficiency is no waste, and to get the maximum amount of that water utilised and taken up by the crop, rather than transpiration, or leakage out of the field, so that the produce that comes out of the field is, basically, I'm harvesting the water out of that field that I put on. The investment I put in, I'm getting out.

Int: And do you think you are managing to increase your irrigation efficiency?

M: I certainly over the last ten years have increased my irrigation efficiency by better pumps, less leaks, better underground mains, and better irrigation machines and booms. My machines are now all computerised, so that we know exactly when they are coming in, and when they are shutting down. My irrigation systems, the pumps are better equipped, they are better on power, more efficient on use of power, they are newer and my irrigation systems are reasonably modern, and it will, I... do you know what, technology is amazing, I can be in Spain and I have been in Spain, I can be in South Africa as long as I've got a mobile phone signal, and my irrigation machine shuts down, I'll get the signal it's shut down. I can then ring it again and I can start the pump up again on a different machine on my mobile phone, and I can be anywhere in the world. And I've done it. So I can actually ring my pump house, my pump house said, "ah, we'll start up". So I can do that anywhere in the world with modern technology, so I'm more efficient, because i can do it from anywhere in the world.

Int: So where do you see it going next? Are there new application methods you could use?

M: Where's it going next... [long pause]. Yeah, I'm a great early adopter of technology. I love technology, I'm very techie. How do I see water? I mean we've got booms, we've got mobile, we've got computers, I mean the next thing really, but we are talking a way away from doing that, will be for irrigation machines that are able to move themselves, robotic machines that you put in the field, and when it gets to the end of the run it folds itself up, moves up to the next place, pulls itself out. But that's a way away, that is. But technology is moving all the while, I'm looking at grading potatoes, how we can do away with employing staff to grade potatoes, because actually, grading potatoes is expensive, I've got to employ four people and actually those people are expensive, it doesn't matter that they are Bulgarian, Lithuanian, Polish... they still cost a lot of money. Those guys doing that job are on £10.50 an hour, basic. When it's weekend work they are on more. And I need

that job done, and that costs me money. And they are doing say 10 hours a day during the peak of the period at that sort of money, and I'm thinking "ouch that hurts, that's a lot of money. How can I do this using technology and machines and robots?". You can have photo cells that look at the potato and say, "there's a bit of green there, a bit of brown there, a bit of rot there" and they can chuck em out. But that's very expensive, and how robust is it? Because if i want to move it from field to field on dirty old, bumpy old tractors and trailers and bouncing around. But yeah, I'm looking at that but I think it will be a little while before that comes to fruition.

Int: What about things like erm drone technology and satellite imagery for working on where in the field needs more irrigation?

M: Yeah, that is soemthing. You can certainly, drone technology and satellite technology, especially in [redacted], where we've got undulating fields and we are a very wet part of the world and you get compaction and you get rainfall and what have you, I can well see that you could fly something over a field that's sloped down to the middle and a wet area in the middle and the water can't drain away, and if I could have perhaps in the future a drone going over to look at the field, to show that that bit's really wet and the edge parts of the field around it have not got lots of water, maybe we can program our machines to understand that technology better, signs they've got from a satellite or a drone that says, I'm going to put 20mm on that bit, I'm not going to put any on that really wet bit, and I'm going to put 15 on here, so tailoring the water to the parts of the crop. But in [redacted] field slope down so if you put 20 mm on there some of it will leak down to there anyway.

Int: And at present it seems like the application methods, it might not be straightforward to programme that in, I mean you wouldn't have the facility to apply water with that precision at the moment.

M: We do. An irrigation machine is a long pipe with either a rain gun or a boom attached to the end of it. Long pipe is on a reel, the water that runs through that powers itself. So as the water runs through it powers a turbine, the turbine causes a rubber belt to go round, that rubber belt goes round a gearbox, that gear box goes round and that gear box is geared to the drum, so that's what's driving the drum. The turbine goes round which drives the gear box which drives the drum and the drum goes round and it winds itself in. Now you set your computer up to put on 20mm, which equals a particular speed. It can go at any speed it wants. On my machines I can program it to delay coming in so it will start up and it can delay at the end by half an hour, twenty minutes, whatever I want to put more water on before it starts reeling in. I can zone it so I can say right, start up, in half an hour's time, reeling in. So it will be putting water on one place for half an hour then start reeling in. I can then program it to wind in at 20mm, then put 10mm on then put 15mm on just by the speed, so come in at 80m/hr, then come in at 40m/hr then come in at 30m/hr. I can do all that now. The problem is how do I link that with actually knowing, and it's the satellite imagery with the drone imagery can tell me. And it can tell me, but I've then got to have a way of putting it into that computer, so there's some definite work can happen there that could make me more efficient by looking at the field and saying top end of the field wants 30mm, bottom wants 2mm, and I can then, if I can gather that and put it into my machine and make it more efficient.

Int: I'm conscious you have a meeting very soon, so last question, what do you think could make your agricultural practice more resilient to water risks? If there's one thing you can pick it could be to do with retailers, regulators or technology.

M: More resilience on water, I'd like to be able to think that the water that I have on my farm is mine. I know that's never going to work because the Environment Agency looks after the water that's underneath my land, but I'm thinking that actually to be more resilient I could actually help with some of this problem, and I don't mind helping if I get helped as well. I'm a very generous man. So if I can take flood water from my local town when had too much rain and is flooding. If I can take that away and hold it on my farm and let some of my farm flood and then let it go gently rather than causing more environmental damage downstream, then I would like to be able to have that water come back to me when I need it in the summer on a dry crop. We do help at the moment, but there's no comeback. We take all the hit. So we are helping people not to have flooded houses, and we helping the environment by not letting it all rush down and eroding something, but there's no come back the other way when I want water in the summer and it's dry... "I'm sorry, you can't". But hang on a minute! It's all one way again. We are helping the environment, we are custodians of the countryside, but when we want to grow a crop that's profitable and we need some water to do it, the EA and Anglian Water, heaven forbid that your tap in your house doesn't have water coming out of it. Oh my god, that would be... all hell would break loose if people went to their house and there was no water today. What would you feel like if and sorry, you can't have a bath today.

Int: Well, that's what's happening in Cape town!

M: It is!

Int: So would the solution be something like public irrigation reservoirs that can be used...?

M: Countrywide.... Because there's plenty of water in this country. There is no end of water for agriculture and horticulture in this country, there's tonnes of water, we just let it go out to sea. So it's about having water from Scotland, from Wales and the wet parts of the country piped to reservoirs and having a countrywide system of getting water to the right places, to the dry parts of the country that need it, like the Eastern Counties. So our water could come from Wales, or Scotland or whatever, and harvest it rather than just let it run out to sea. Now I'm not saying stop it running out to sea because you can't stop rivers running out to sea because actually those rivers are required for fish coming up, salmon. So you can't take it all, but there's a happy balance here, and there's certainly, in flood times, water can be moved from one part of the country to the other, so a country wide system to move water, like we do with electricity, so if we need electricity and we are short of electricity in London it will come from a turbine in Scotland on a lock. Someone will open the gates a bit more produce a bit more power, straight down to London. But we haven't got anything like that for water yet. So yeah, hydroelectric in Scotland for power in London, that happens.

Int: Thanks that's great. I think we've covered pretty much everything.

M: Well, you've got my email address, if you ever need to come back to me and say, what did you mean by that, which there probably will be some of that, just come back to me. I don't mind doing that.