Drones Podcast Transcript

Will E: Hi, I'm Will Evans and this is 'Ahead of the Field' from NFU Mutual, exploring how farmers are growing their businesses for the future. Of all the technologies that are set to change the world right now, drones are one of the most exciting. When it comes to farming, they could be one of the most useful. Of course, drones have been in the news a lot recently, so we thought, in this episode, we'd explore the detail.

Yes, they're fun to play with, but can they have a significant impact on our everyday work on the farm, and what real-life problems can they solve? And what issues do you need to watch out for to make sure you're not breaking any laws or regulations? We're on the farm, talking to experts from drone services, the Civil Aviation Authority, insurance and the local police, to try and answer all these questions in one go. If you want to find out more about NFU Mutual's new Drone Insurance Solution, just search for 'NFU Mutual drone' or talk to your local agent.

So we've come to Hampton House farm in Kineton, Warwickshire, run by the Gasson family, and we're joined by Toby. Hi Toby.

Toby G: Morning.

Will E: So tell us what you do here and why you've started using a drone as part of your work.

Toby G: We're a 400-acre arable farm, growing mostly cereals, oilseed rape, nearly everything is arable, not really any grassland at all. We've recently bought a drone just to see if we can try and improve the way we do things when it comes to looking at crops, more than anything. We've had it four weeks, it's been more of a playing area at the moment, just trying to work out how it all works, but it will come into its own, hopefully, in the next two months or so when the growing season starts again.

Will E: Okay, and how much did it cost? Was it a big investment?

Toby G: In the grand scheme of things, no. It was just over £1,000, so it's probably one of the cheapest things on the farm, really, in today's machinery prices,

Will E: Definitely, if you compare it to some of the machinery prices at LAMMA recently.

Toby G: Yes, you don't get any change out of £100,000 now, do you, for a tractor or anything? So, it's quite good really.

Will E: And do you know a lot of other farmers who are using drones?

Toby G: I know a couple, that's probably where I got the idea to looking to buying one from. I was doing some drilling for a chap in the autumn, he

had a drone and he came and took a video of me drilling and that's where I first got the idea of it from really.

Will E: So, you've not had it very long then, are you already seeing benefits?

Toby G: We are seeing benefits, not so much looking at the crops at the moment because they're dormant, so not really doing anything regarding growing, and so we've been using the drone for chasing pigeons off the rape, which works brilliantly. But yes, the middle of February onwards, hopefully, when everything starts growing a bit, we'll be able to see.

Will E: So, long term, where do you see the benefits being?

Toby G: Long term, using the drone, we would be looking at the crops and the growing season and then we can look a disease levels and weed levels and see where the good and bad areas are filled. We, hopefully, can use it for lots of things, drainage would be a great thing to look at, looking where the wet areas are, if we've got a broken drain, hopefully, we'd be able to spot it from the air more than on the ground, because you can see a lot more from the air.

Also, looking at buildings as well, we've got quite a lot of grain stores around and there's always a leaky roof somewhere, so it's always handy to see where the issue is. I'm completely new to it at the moment, but it would just be very interesting to see what happens in the next year or so when we learn a bit more about how we're going to use it.

Will E: I'm also joined here by Jack Wrangham from Drone AG, a company specialising in developing drones for agriculture. Jack, what's the range of drones available for farmers and what sort of jobs can they do?

Jack: So, there's a huge range of drones out there, ranging from very small systems that are very cheap, up to systems that are quite large and heavy and cost an absolute fortune. For the most part, we recommend small drones that a farmer can buy from any shop like Amazon that are generally around about £1,000 or even less. They only have RGB cameras on them, but you can still spot a lot from the air with those, everything from crop variation through to pigeon damage and things like that, and even measuring for Countryside Stewardship and things like that too.

Will E: I am a complete beginner on these things, what do you mean by an 'RGB camera'?

Jack: RGB is 'Red Green Blue', it's a standard camera, the same kind of camera you get on your phone or you'd buy off the shelf and that kind of thing. As opposed to something that would use other spectrums of light like near-infrared to potentially spot more variation in a crop.

Will E: Are you seeing a big increase in levels of interest from farmers?

Jack: There's been a level of interest that's been steadily increasing for the last few years, yes, but I would say, more recently, it's been a more educated increase in interest. Farmers are starting to understand where

the value is rather than just all the hype around drones in general.

Will E: I think you've brought some with you. Toby, do you want to take us out into the field so we can have a demonstration?

Toby G: Yes, absolutely. We'll go down the other end of the farm to a field of wheat and we'll be able to see some demonstrations down there.

Will E: So, we're down in the field now, it's all in the back of the truck, is it, I take it?

Toby G: Yes, sure, everything fits in the back of a truck, no problem.

Will E: And are they fairly simple to use?

Jack W: Yes, these days, they're extremely simple to use. There's one lead manufacturer in the world called DJI, they make probably about 75% of the drones that everyone uses, and their technology is very advanced and extremely simple. Anyone can be using a drone, generally, within about an hour.

Will E: For farmers, what time of year do you think they're likely to be the most useful?

Jack W: There are different times of year for different things. Generally, we concentrate on early season for spotting potential early issues with establishment or things like pigeon damage and things like that. And then as we get into the spring, we're looking at faster crop scouting, more efficient crop scouting and then looking at things like nitrogen application.

Will E: Why are they better than, for instance, using satellite data?

Jack W: I wouldn't say they're better than using satellites, satellites definitely have their place, they can give a good overview of a large area very, very quickly and at low cost. But when we want to start to get down into more detail and that kind of thing, that's where drones come into play, because they're a lot closer to the ground, we can get a lot, lot more detail than satellite, which means we can be a lot more accurate.

The slight difference between this one and the one Toby has himself is, we do have an additional camera on the front. This is a near-infrared camera and it allows you to spot more subtle differences in crops, which is quite good if you're starting to go to multi-zone nitrogen application and stuff like that where you want to get really, really targeted on what you're doing.

Will E: What sort of height and range do they have? How far would you go with something like that?

Jack W: You'd be surprised. They can go a lot further and higher than you'd ever need or, in theory, want to go. Kilometres, if you wanted to. But they do also have built-in fail-safes that will stop the drone flying able a certain height and certain distance.

Will E: A drone like that, the kind of drone that Toby would be using, how long will the battery last for on that?

Jack W: You get about 20, 25 minutes flight time and you can generally cover up to about two hectares a minute, so you can cover quite large areas quite fast, even with a small drone like this.

Will E: And they re-charge pretty quickly?

Jack W: Yes, I mean the batteries will re-charge in about half an hour or so and you get car chargers for most of them. We tend to have a few batteries with us, three or four batteries, and you can be mapping all day if you need to be.

Will E: Toby, your drone would be pretty similar to this one, what kind of model are you using?

Toby G: So, we're using a DJI Mavic Pro, very similar to Jack's one he's got here, but without the IR camera on top.

Will E: When you first got it and you opened up the box, were you able to use it pretty much straightaway?

Toby G: Yes, once we'd charged everything up and we read the instructions and away we went really, but after 20 minutes, half an hour of flying, you soon realise who easy they are to fly.

Will E: So, shortly, I'm going to be speaking to someone from the CAA. There are codes and legislation in-place with something like this, how familiar are you with that?

Toby G: I sort of know the basics, because when we got the drone, inside was a little leaflet with the drone code on, explaining about the height we can go to and the distance and the basics, where you can and can't be with an airport. But, we're very lucky, it's a big, open area here, so it's probably the best place to start if you're a complete beginner because it's not a lot around. So I only know the basics, I don't really know any more than that.

Will E: So, you're holding onto a circular, orange bag, what's all that about?

Jack W: Sure, so this is a landing pad which pops out like that and it's what we use to designate where the drone is taking off and landing from. It also protects the drone from any kind of damage from water or dust and things like that in a farm environment.

Will E: Is it a problem if it's lashing down with rain? I suppose you wouldn't take it out if it was raining anyway.

Jack W: You wouldn't want to fly, for multiple reasons. The main ones being that water can damage the drone, a little bit of drizzle is probably not going to do too much damage, especially if you dry it out afterwards. But also, the crop looks very different when it's wet, so you start to get variation

which could be down to that water level rather than the actual crop.

Will E: And we're standing in a very big, open field, it's quite breezy today, is that an issue? Is wind a problem?

Jack W: No, for the most part, it's not, the drones are very, very good at handling wind levels. 20 miles an hour is a sensible limit,

So, we've got the drone on the landing pad, we'll power it on and we'll power the radio on and let them establish a communication. While that's happening, we can also plug the iPad I'm using in, and then we'll let everything boot up.

The drone will go through a series of checks to make sure everything is okay with it, that it's happy with all its sensors and all that kind of stuff. It will establish a GPS connection so it knows where it is and at that point, everything will sync up and we'll be able to fly, and now we have 'drone connected', it says it's ready to go.

So, at this point, we can step back and we're going to fly automatically, so it runs through a checklist, again, to make sure the camera has got an SD card in it and all that kind of stuff. It will upload the flight plan to the drone and at that point, I can press 'take off' and the drone powers up. And now, what I'm doing from a pilot's perspective is, I'm monitoring the drone, I'm making sure it's doing what it should be doing. At any point, I can override it and take manual control back and land it, if need be, So, I'm just making sure there is no other aircraft in the area that is going to be an issue and that it's climbing to the correct height, which is nearly there.

It's going up to 100 metres, which is pretty high, but still below the legal limit, the legal limit is 120 metres. It's reached altitude there, so now what it will do is, it will turn and it will fly off to begin mapping in the far corner of the field. You can see, we have a camera feed on the screen as well, so we can even start to see the field on a live camera feed as the drone is flying and it makes its way over. You can see, on the map here, it's flying off to that far corner and that's where it's going to start mapping and then it will start working its way backwards and forwards across the field. At this point, it's over here, I can see the dot, so although it's quite far away, I'm still aware of where the drone is in the sky.

Will E: It's moving a lot faster than I expected it to.

Jack W: Yes, they can fly pretty quickly, it's around about 12 metres a second, it will fly at and actually, you can see it on the speedometer here, it's actually going about ten at the moment. You can see the live video feed here, it flying over the field and you can see there's a bird below there.

Will E: That's really clear, isn't it?

Jack W: - and all that kind of stuff. So, even from the live video feed, you can start to see stuff. What we get with a lot of agronomists is they actually use the live video feed, as the drone's flying, to note if they need to go and have a look in the field while it's flying as well. And you see, now, it's

started ['image capture started'], so now it's actually doing the mapping part of the mission, it's started its grid shape and it will start taking photos. You can see, what we get is, it's starting to take the photos, starting to appear on the map. So, this is the map being generated as it's flying.

Will E: So Toby, is this what you envisaged when you bought your drone?

Toby G: Probably not, but probably because I didn't really know that they could do that sort of level of mapping, but now we do, then we probably would use it, yes.

Will E: How is it going to change what you do? Are you going to be doing less walking up and down the fields now?

Toby G: No, we won't be doing any less walking up and down the fields because I don't think a drone will be able to see the difference between black grass and a wheat plant, to be honest, so we've still got to have feet on the ground, walking, crop-walking every ten days or so.

Jack W: We have a new app called 'Skippy Scout' which will actually allow you to do the crop-walking side of things with a drone as well by bunny-hopping the drone around the field and taking sample photos from only a metre above the crop. Those photos will allow you to see things like emerging black grass, insect damage and all that kind of stuff as well, so that's kind of the next stage. You use the mapping to guide where you then scout with the drone rather than walking a field.

Toby G: And I would be able to do that with the Mavic Pro that I've got now without having to change too much?

Jack W: Yes, it's all designed to work with any off-the-shelf drones, exactly like the Mavic.

Toby G: Okay, that's very interesting.

Will E: This is an arable farm, I come from North Wales, mostly livestock farms up there, what about those livestock farmers? What kind of benefit is a drone going to be to them?

Jack W: We're seeing a lot of livestock farmers, especially up in the hills where they have to travel quite large distances to check sheep, using little drones to help them with that, flying around and having a look at sheep just using the live video feed instead. They're seeing savings in time and fuel on their quad bikes and things like that as well.

I think that's more in its infancy in what you can actually do with a drone and as technology develops, I think thermal technology in particular, will start to allow livestock managers to really see if there's a problem with their livestock in terms of health and that kind of thing. Then, obviously, as AI comes more into the mix, that will be more and more automatic as well, but at the moment, it's very much a manual job, but they are finding uses for drones, even like that.

So, it's just on its way back, it's going to come to a point here, hover, and then it will fly back and hover over its home point, which is the landing pad. At that point, my controller will start beeping, which tells me it's landing. So now, it will start coming in for a landing, it will just start slowly descending down and at this point, again, as the pilot, I'm just monitoring it. I can take control and land it myself, so if, for some reason, the GPS was slightly off and it was going to, potentially, hit something that I didn't want it to, I can manoeuvre the drone myself, but it looks good, so I'm just going to let it land automatically.

And that's it, done, so at this point, we have the live map there and we can start using that straightaway to scout the field, either with the drone again or by walking. We can also upload all the imagery to the Cloud where it gets processed into a very, very high-resolution map that we can use later for other things like variable rates and things like that too.

Will E: Wow, so there are endless opportunities really, with them.

Jack W: Yes, the key thing for us, which is what we try to educate farmers in in general is that the difference comes with these when you start using them as an automated mapping tool. So, as soon as you automate a system like this, it becomes infinitely more useful than when you're trying to fly it manually, because it can do so much, so quickly, without you having to actually try and do it all yourself manually.

Will E: A lot less time-consuming, I guess.

Jack W: Exactly, yes, that's the key thing.

Just before we carry on with the rest of this episode, just to remind you that NFU Mutual has recently launched its drones insurance solution, and you can find out all about that by searching NFU Mutual Drone. Or of course talk to your local agent. Right, back to the program.

Will E: Now then, given the recent controversy around drones, you might, understandably, be nervous about the regulations and making sure that you stay out of trouble. To get some definitive answers on this, I've just stepped into the grain store and I'm speaking to Jonathan Nicholson down the line, the Assistant Director of Communications at the Civil Aviation Authority.

Coming on to drones in farming and in particular licenses, does every farmer who uses a drone need a licence from you?

Jonathan N: No, in most cases, they probably don't. What we have in the UK is a system where we approve commercial operators and when we say 'commercial', what we really mean is, did you know you were going to get paid to fly your drone before you flew it?' If the answer to that is no, that's not commercial use, so if, for example, you think of your drone that you've bought to use on the farm in the same way as your tractor or a piece of spraying kit, they are all tools that you use on the farm. They're for your use for your farm and if that's the way you're doing it, like the

guys there are doing a survey of their own farm, if you like, it's their drone, it's their farm, then no, you do not need an approval from us. But, if you're in the situation where your farmer next-door, your friend comes along and says to you, "You've got a drone, I see you're doing fantastic stuff with it, it looks really useful, could you come and do the same survey of my farm and I'll give you £50 to do it?" That absolutely becomes commercial use and that's when you need a commercial approval from us.

Will E: And what are the basic rules governing where you can and can't fly a drone?

Jonathan N: We have what's called the 'Air Navigation Order' in the UK, which is the actual legal rules, if you like, and that covers everything from British Airways to major airports. But we actually summarise it in something that's much easier for people to get their heads around which is called the 'Drone Code', and you can get it at the website called 'dronesafe.uk'. It's really simple rules about where you can and can't fly a drone. Actually, for farmers and in the farming community, you guys probably have more freedom and a better place than lots of other people because you've got more open space, it's your space and you're not going to encounter large populations of people or lots of buildings and things out of your control.

So, most of what you want to do on a farm is pretty much possible, but really think about, you shouldn't be flying your drone over 400 feet, that's 120 metres, and you shouldn't be flying it closer than 50 metres to people or buildings out of your control. Now, if they are under your control, it's your building, the people who are around, you've told them what you're doing, you can fly closer than 50 metres too.

Will E: Do you have to keep the drone where you can see it at all times?

Jonathan N: Absolutely, yes, another key thing, you must keep your drone in sight at all times. So, don't be tempted to have a drone that can fly, say, I don't know, one, two kilometres away and you've got fields that go one, two kilometres away, to fly at that distance, unless you're with it. You need to have it in your sight at all times. Now, that might be hard for some people to understand why, when you're in the middle of a field, but it's all about having that visual perception of your drone to be able to avoid other things that are in the air.

So, say, for example, a medevac helicopter comes along in a rural location to land on a country road to attend to a car accident and it comes across your field, it could be 200, 100 feet, so you need to have that visual perception of where your drone is to be able to move it out of the way. You've both got equal rights to the airspace. So that helicopter has no more right to be there than you do. But in reality you're going to have to see and hear the helicopter before, way before the pilot of that sees your drone.

Will E: What are the most common ways that drone users do fall foul of the regulations? What are the penalties involved?

Jonathan N: So, the most common things we see are people flying too high and people flying too close to things that they aren't controlling, so too close to property and people that aren't with them, if you like. And too high, again, you lose that visual perception and you've got much more chance of coming into conflict with other things in the air. Ultimately, this is all UK law, it's not like best practice, it's law, so if you break the law, you could be subject to police investigation and prosecution. And ultimately, if you endanger an aircraft, if you break these rules and endanger an aircraft, a helicopter, you could go to prison for five years, so it is a pretty significant offence if you're found guilty for that.

Will E: Do farmers need to alert neighbours or anyone else around them if they're using a drone?

Jonathan N: It really depends what you're doing with it. I mean in most cases, as I say, you're in a pretty great position in the fact that you've got lots of space, it's your space, and there's probably not much else around. If there's another farm nearby and there are buildings or cattle or you do have a farm that borders … so I grew up in a house and at the end of my garden, on the end of my council estate, was a farmer's field, and in that situation, you would have to keep that 50 metres away.

But the only time you really need to tell them is if you're doing something that either would impact on them. To put it the other way round, we get lots of farmers complaining about drone users disturbing wildlife or livestock, so think about that, think about your neighbours. But generally, because you're in such a unique position, you're pretty much a self-contained unit really on your own property.

Will E: What are the repercussions if farmers use drones commercially without a licence?

Jonathan N: So, if you use a drone commercially without a licence, you are breaking the law. It's like any other law in the country, you could get caught, you could get prosecuted and you could end up with a fine. They are not laws that are there just for the sake of it, they're there to protect people and property and they're as much there to protect farmers that aren't using a drone, from other drone users, as they are to protect people that might be affected by a farm use. They're there for good reason, but if you do break them, then yes, you could be punished.

Will E: Do you have any final advice for farmers who are using drones or thinking of using drones as part of their work?

Jonathan N: Yes, so the one piece of advice we give to people, and we talk to lots of people at exhibitions and events and they come to us and go, "I'd really like to get a drone and I really want to get into drones," and we say to them, "Well, what are you going to do with it?" and they go, "I'm not sure, I just fancy a drone." We get that a lot. The people that make a success of it are the people that know exactly what they want to do with the drone. So the guys you've had there today that have been doing the crop surveys, things like that, perfect use for a drone. Drones can do that way better than anything else and cheaper and more effectively as well, more accurately, but it's actually knowing what you want to do with

it.

I mean, yes, there's the fun element as well, there's the photo element, there's the video element, you guys have got the space to actually do loads of things with drones that are fun as well as for work. But if you're talking about in your business and using it to help you as a farmer, then I would say to people, know exactly what you want to do with it, because then you can also buy the right drone and get the right advice.

Will E: Thanks very much Jonathan.

Back here on the farm, Charlie Yorke and Edward Wheaton are here from NFU Mutual. Charlie, what do farmers need to consider regarding insurance cover if they're going to start using drones?

Charlie Y: So, as Jonathan has already mentioned, it's really important that farmers understand how they're using the drone. Are you simply using it for fun, it's a toy on the farm, or are you taking it a little bit further and using it for commercial purposes? Whether that be providing services to other farms, you're on their land, you're surveying the crop, like we've seen today, that farmer really needs to make sure they've got the correct insurance in-place and the qualifications there.

But the main thing, for me, is making sure the farmers really understand, what's required from them. So, what the CAA state is that you're required, as a commercial use, to have the third-party liability insurance in line with (EC) 785/2004, which is basically making sure the minimum insurance requirements are met. It's just making sure that the farmers understand their use, their need and the risks that might be present.

Will E: And what are the risks if you don't have the right insurance in-place?

Charlie Y: As with any activity you carry out on the farm, there are always risks. With drones, it's really important you recognise these and do what you can to mitigate them. As the drones are obviously up in the sky and flying around, you've got the element of property damage if the drone falls to the ground, hits a nice shed or whatever, you've got that element. The most important and critical risk is the liability aspect. What happens if that drone hits somebody? It's making sure you've got those liabilities covered.

Will E: Tell us about the new Drone Insurance Solution that NFU Mutual have launched.

Charlie Y: So, NFU Mutual have recently launched its new Drone Solution to support farmers and our farming communities. The cover is there to make sure farmers are protected, whether they're using the drone commercially or simply on their own farms, and it's to make sure they get the most out of this new, exciting technology. We've seen, today, great examples of Jack and Toby using the drones and just how beneficial they can be, and this cover is there to offer support for farmers like that.

Will E: Edward, you're the local agent here and Toby is one of your customers, have you seen an increase in drone enquiries recently?

Edward W: We have. There is a certain reticence to talk about it because some of them don't realise the insurance implications, perhaps, but this summer, I started asking if I knew there was somebody under, say, the age of 30 on the farm, had you got one? I went through a phase of autumn renewals, digging up drones, left, right and centre, so I'd say they're really quite common and, of course, it's a great opportunity for somebody who is younger to have quite a bit of fun and re-discover what their farm looks like from above.

So, it's good for the sons and daughters, you know, the younger generation coming on who want to innovate and do things and it's good and it's appreciated by parents too. I've been in farm offices and they're showing me the drone film, so collective discussion, that's what we're looking at.

Will E: What's your impression of drones in farming, long-term, can you really see the benefit?

Edward W: We're at the fun stage, people are experimenting and buying them, thinking of other applications. Who knows, five and ten years' time, they'll be doing the work out in the fields. Beyond my imagination.

Will E: Are farmers a bit unsure of what insurance they should go with for these?

Edward W: Yes. As I said, there's a bit of reticence to talk about it because they're not sure whether it's an insurance subject or not. I would say, as a local agent, it's part of our job to probe a bit with activities on a farm just to check whether it's confined to the farm or they've got some other commercial application. And here, it's new territory for all of us, but I welcome this product as something where we've got a structure we can build on and we can tell them what is allowable, what needs additional cover. And that's these extra applications, whether it's going and doing mapping work for the next-door farm or somebody they do contracting for.

Will E: So, if farmers listening to this want to find out more about drone insurance, where can they go?

Charlie Y: First off, I'd say speak to your local agencies. Farmers' needs will vary so it's really important you speak to the local office, explain to them what you're looking to do, they'll be able to help and give you that advice and shape that product and solution for you. Apart from that, it's really important to familiarise yourself with the regulation, with what's going on in the industry of drones and look online. Look at the different forums and support sites, companies like Drone AG, they'll all be there to support and offer you that help and guidance.

Will E: We're joined by Andy Stevenson, Chief Pilot from Warwickshire Police. Andy, you're a bit of a drone enthusiast yourself, aren't you?

Andy S: Yes definitely, I've been flying remote control planes and helicopters and things like that for, easily, 15 years. Recently, about nine years' worth of drone flying, and now that's slid into my role within the police

and now I'm the Chief Pilot for their programme.

Will E: So, you've really seen them develop over those years.

Andy S: Yes, from products that were very manual in the way that they would fly, lots of input from yourselves to things that you've seen today. It's a massive change in technology and where we'll be in five years could be very interesting.

Will E: How do you use drones as part of your work with Warwickshire Police?

Andy S: Currently, we use them for all sorts of different tasks within the police, ranging from searching for missing people, open areas such as this, you can clear a very large area very, very quickly, to recording accurate information of car crashes and things like that to then be presented at court for and against the person involved, effectively.

Will E: And they would be very effective in use with rural crime as well.

Andy S: Our area is very well-suited to the use of drones, being so rural. We have places that, at times, we have to get to or can't access by the vehicles but we may want to follow a track that we've seen, and we'll put the drone up and have a quick look there.

Will E: How can farmers like Toby make sure that you're not knocking on their door?

Andy S: As I think you've already mentioned, if they're complying with the Drone Code and the regulations that are currently laid out, working in a manner that's within their permission for commercial operations if required, things like that are going to mean that they never come to our notice. However, it would be quite nice if farmers and rural communities who are suffering with criminality, that potentially they record something with one of their drones, they might contact us and we can go and use that footage to assist with a prosecution. So, I'd like to be knocking on the door for the right reason.

Will E: And is that a civil offence or is it a criminal offence?

Andy S: So, in October 2016, prosecution of the misuse of drones was handed over to the police from the CAA for us to investigate and prosecute, so it is a criminal offence. Many of the sub-sections, so flying beyond the visual line of sight or flying close to people or property that you're not in control of, constitute reckless endangerment with the drone that would be what people are prosecuted with. We would much rather educate the community and, as I say, the hobbyists are very good at self-policing. There's a very small minority of people that are flying too far or too close to things and giving the rest of us a bad name.

Will E: So, I'm back with Toby and Jack now. Jack, you've got the results of the mapping there, what can you see?

Jack W: Sure, so with a quick live map like this, you can start to see, straightaway, where there is variance in your crop, where there's not as much growth

and where there's more growth. That acts as a very, good guide for where you might want to go and crop-walk or use something like Skippy Scout to go and see, in closer-up detail, what's actually happening in those areas.

Toby G: On this particular photo image here, the red is indicating low growth.

Jack W: That's the areas of low growth as compared to a deeper green, which are areas of high growth.

Toby G: Okay, on the whole, I'm pretty pleased with that really, I think it looks alright.

Jack W: It looks like a pretty good field to me.

Will E: So, looking at that, you can really see the obvious potential there, can't you, Toby?

Toby G: Yes, you can, it's very obvious. That sort of highlights maybe it might need a bit more fertiliser when it comes to fertilising.

Jack W: Yes, again, at this time of year, you would want to give it, obviously, until the spring, but if you were seeing this type of thing in the spring, then yes, that's when you'd see lower growth where you'd maybe want to start applying fertiliser as opposed to the areas of high growth where you probably wouldn't need to. So, you could immediately start to see, hopefully, a saving on fertiliser.

Toby G: Yes, so I you're looking for black grass and stuff, from here, if we're looking at this sort of image, we wouldn't really be able to spot black grass, but with Jack showing earlier your other drones where you can zoom right in, you can tell individual black grass plants. Because obviously, a black grass plant and a wheat crop, at this stage, they look fairly similar.

Jack W: Yes exactly, so the key thing is to remember that higher level imagery is going to show you where there's a potential issue, it's getting in low with something like Skippy Scout that will give you that information of what the actual problem is.

Will E: Toby, what sort of research or prep did you do before you bought your drone?

Toby G: The only research I did, really, was finding out which one was best to buy. Completely new to it, didn't really know what I was looking for, just sort of going on word of mouth really. After seeing the sort of stuff that Jack's done, mapping the field, we'll be able to do all sorts of exciting things in the long run.

Will E: We can see that it's going to save you a lot of time, do you think it will save you money as well?

Toby G: It should do, especially if we were to go down the route to what Jack is showing here. At the moment, we didn't really have any idea of how to

use it in this sort of way by mapping, but now we do. I mean there's no reason to say why we couldn't save money in the long run just with this simple example here of seeing where your growth rates are.

Will E: Is there the possibility that it could even make you money if you continue to get requests from other farmers in the area?

Toby G: Absolutely, if I do my commercial licence, yes. That's an option, definitely, I've had it four or five weeks now, I've had two people approach me, friends, farmers and one is a butcher as well. There's no reason to say why I couldn't pick a bit of work up to maybe pay for it.

Will E: So these farming friends that have asked you to take your drone onto their places, what kinds of things are they after?

Toby G: I've got a good friend of mine who farms up near Banbury and he's got a full mixed farm and he also has a farm shop and does a bit of butchery. He wants to do a promotional video for his farm so he can put it on his website and his Facebook page. When he heard I'd bought a drone, he was really, really keen to try and do something like that, so there's always the option of stuff like that. And then I've got another friend who does a lot of drainage work and he wanted to get a map or some photos of some fields for drainage, see if there are any obvious outlying drains in the field, from the air rather than by foot. So, there are plenty of opportunities out there, so we'll have to see.

Will E: So, would you consider getting your commercial licence?

Toby G: I would, definitely, yes, because I can't really do a lot of outside work if I don't have it, so yes, I'm already thinking about it now.

Will E: Is it quite hard to get a commercial licence?

Jack W: No, it's not particularly hard, it's a two-day course, it's mainly classroom-based, so it's all theory about air law and things like that. Generally, you have some exams for each module, again, not particularly difficult, you just need to learn the stuff. It costs between £700 and £1,200, depending on who you use, and then there's a short flight test as well, which is just the idea is to prove that you're a competent flying the drone and that you can land it safely and that kind of thing as well.

Will E: Jack, what does the future hold for drones? Will they all just fly themselves eventually?

Jack W: Yes, I think they will. You've seen today that they already do to a point, where we're at now is, we need to remain within line of sight of them, you need to have a pilot there monitoring the drone system for safety reasons, which is absolutely fair enough. But I think as the technology progresses to the point where they can sense and avoid more themselves, the systems will be capable of flying around by themselves in a completely automated way. Then, sending that data, potentially, to automated machinery on the ground as well, which is then going to carry out instructions.

Will E: So, we're coming to the end of the day here now and we're really grateful to Toby for showing us around his farm and to Jack for giving us a demonstration of how the drone works.

So, after seeing that and being so impressed, would I buy one for my own farm? I'll certainly be looking into it. It was the mapping and so the drone went up, it was hardly any time at all before they had a fully completed soil map on the tablet in front of them and it was such a quick turnaround as well. The temptation is to think of drones as a bit of a toy and a plaything, but when you can actually see something that's going to benefit you financially, so quickly, you can't help but be impressed by that. It's given me an awful lot to think about and I hope it's been useful.

Don't forget that NFU Mutual has recently launched its Drone Insurance Solution and you can find out all about that by searching 'NFU Mutual drone', or, of course, you can talk to your local agent. In the next episode of 'Ahead of the Field', we're in Northern Ireland where a farmer has diversified into offering tree gifts online. In the meantime, from me, Will Evans, NFU Mutual and everyone here at Hampton House Farm in Warwickshire, it's goodbye.