A niche for every interest

Plant breeding isn't a one-dimensional role; it's a multi-faced industry at the cutting edge of technology that's becoming ever-more important for agriculture's future. *CPM* explores the career possibilities.

By Melanie Jenkins

What image does a career in plant breeding elicit? If it's the white lab coats, safety goggles and petri dishes of the school science lab then this doesn't even go part of the way to encompassing the role of a breeder and the many and varied careers that tie into this industry.

Arguably, it could be said that plant breeding is having more of an impact on agriculture now than it ever has. Offering the potential means to significantly cut insecticide, fungicide and even herbicide use, it could also help to reduce nitrogen requirements, improve water utilisation and help plants to cope with the stresses caused by weather events or climate change.

As it increasingly embraces advancing technologies such as genomic selection and the use of drones, a whole raft of new roles could open up within the industry. "Agriculture and technology go hand-in-hand, as the industry strives under social, environmental and productivity requirements, and breeding can be an important player in this," says ADM's Chris Guest.

"There are exciting new technologies emerging meaning new skills will be required, such as greater IT literacy, more stats-based analysis,

Breeding solutions

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increased drone operations and Normalized Difference Vegetation Index (NDVI) measurements, rather than individuals in fields with a ruler.

"And the industry will have to be alive to AI because it's a tool that could be harnessed and utilised in the plant breeding space and by commercial seed businesses," he adds.

SHIFTING SPHERE

Susan McCallum, plant breeder at the James Hutton Institute, agrees that technology is always evolving. "When I started in the industry, genotyping was the bottleneck but now it's phenotyping. Aspects such as robotics are changing the game, while gene editing is providing a whole new approach. Because of this, the industry is opening doors for new innovators with fresh ways of thinking."

According to Chris, there are numerous diverse careers related to plant breeding. Having worked for both a plant breeding firm and on the supply chain side of the fence, Chris has first-hand experience of how careers in the industry are tied to one another. "Purely within plant breeding there are two core areas: the technical or practical side, and the commercial side.

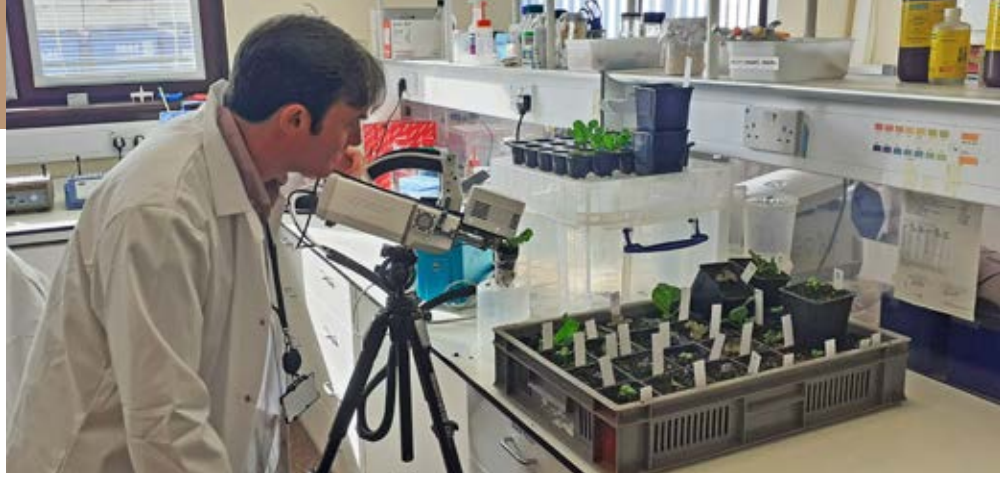
"On the technical side are the plant breeders themselves, but they require a team of people to make their jobs possible from those running and working on trials, to practical on-farm roles, a harvesting team, pathologists and even statisticians, working with official trial operators including AHDB and Niab as varieties move closer to commerciality.

"The commercial side could involve working on official national trials, roles with BSPB and AHDB, Niab, merchants or seed multipliers, marketing and even to the point of seed cleaning and treatment, or in sales. It's a huge sector and I believe it's often overlooked with both skills and resource gaps," he notes.

An aspect that Limagrain plant pathologist Rachel Goddard didn't realise immediately when starting her career in plant breeding was how many different roles there are within the sector. "When I first considered it as a potential career choice, I didn't necessarily want to be a plant breeder and wasn't sure how my skillset would fit within the industry.

"But if you're remotely interested in the sector then it's likely you'll find a role that suits your niche because it encompasses so many different opportunities."

Working at the James Hutton Institute,

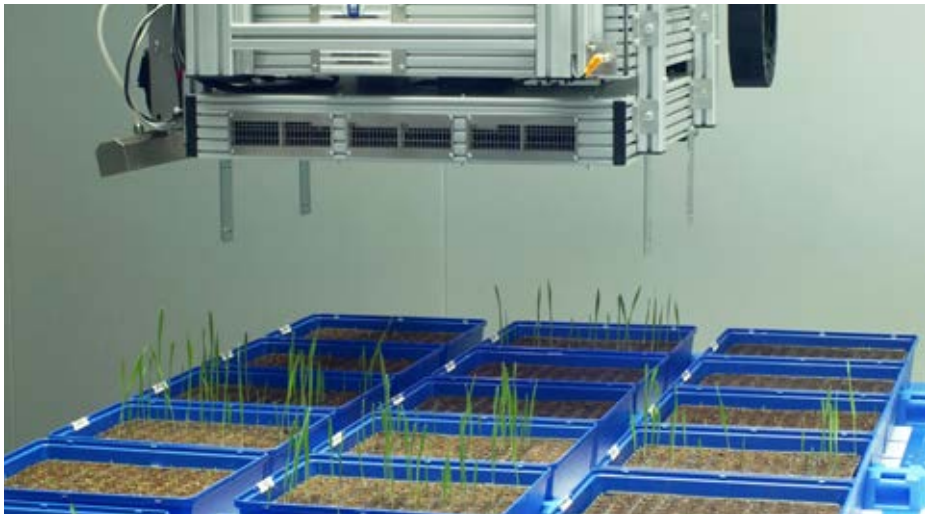


Unconventional journey

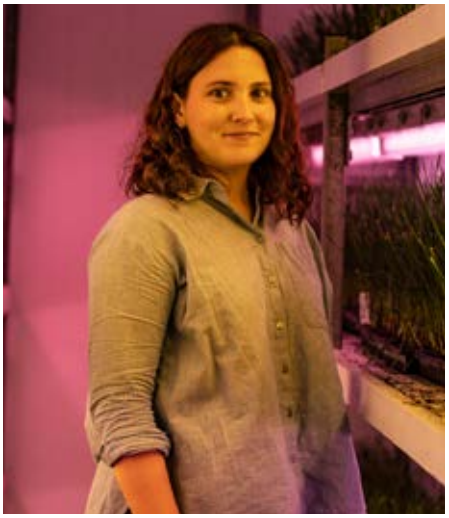
The James Hutton Insitute's Rob Hancock had a far from conventional journey into plant breeding, having studied a degree in biochemistry and marine biology.

Rob Hancock feels that his position is halfway between academia and industry. "It's an area where you can define your own career path with a lot of capacity to follow your own interests – so long as you can source the funding.

"We're already seeing the expansion of controlled environment agriculture ▶



Advancing technologies
High-throughput phenotyping platforms can help to reduce the bottleneck around linking genetic variation to crop performance.



Attracting new entrants
Limagrain's Rachel Goddard believes the changing climate and threat to food production will raise awareness of plant breeding which could attract new entrants.

and in genomics, which are both fast-moving and increasingly significant areas. And plant breeding is an area where there are skills shortages; we struggle to recruit into academia, so there are career openings available.

"I believe that as food disruption rises up the political agenda and home-grown food becomes more important, we'll see increasing opportunities in this sector," he adds.

Although Chris came from a non-farming background, his passion for field sports took him to Cirencester to study rural land management. He then came across a role as a trader at what was then Gleadell Agriculture, where he went on to become seed manager in 2010. "It was during this period where building a network really set me up for my career," he comments.

Chris then took a role at LSPB, which is now NPZ UK. "I'd had a desire to go into plant breeding with the holistic vision of 'what are we working towards in three, seven or even 10 years' time?'. It's an area that's always excited me – using solutions to challenges such as growing populations.

"I believe plant breeding is about enriching human life in conjunction with supporting nature. We're helping to feed an increasing population on a decreasing area and therefore productivity gain – most of which comes through genetic discoveries from plant breeding – is a large part of that."

> ***"I wouldn't say it's been my academic qualifications which have helped me to succeed but the people around me."***

Chris recently returned to ADM as head of agri-inputs. "I'm excited to connect people at the plant breeding end of the industry to those at the point of consumption and the key stakeholders in the value chain. The role of merchanting is about bringing breeders and consumers together to create a vertically integrated business."

Rachel says she entered the plant breeding space through an undergraduate degree in plant and human genetics. "At first I didn't think too much about the plant side, but I found the modules and lectures really interesting so when I finished my degree and saw a PhD at the John Innes Centre in cereal pathology – specifically barley diseases – I applied for it. I hadn't really thought of plant breeding as a career until then."

The role was Rachel's first exposure to the industry and gave her a grounding in pathology techniques which she believes has been useful in her current role with Limagrain.

She then undertook a postdoctoral qualification with the John Innes Centre focused on wheat diseases. "This gave me further experience of field trials and built my confidence, and because it was an international collaboration, it exposed me to plant breeding abroad."

From there, Rachel started her current role as a plant pathologist with Limagrain in 2021. "There was a transition from research into industry, but I feel settled now," she says.

UNCONVENTIONAL BEGINNINGS

Whereas Rob's journey into plant breeding was far from conventional, having studied a degree in biochemistry and marine biology. "I had no idea what I wanted to do, so I undertook a year in immunology followed by a PhD in microbial chemistry before moving to the US to do a postdoctoral degree looking to understand how rhizobiales signal to roots to form a symbiosis."

Upon his return to the UK, he joined the James Hutton Institute as a biochemist investigating crop physiology. "I saw the value in taking the genetic approach to identify the genes that underpin various plant functions."

Although not a plant breeder, Rob works with geneticists to understand the function of genes and how specific genetic variance influences crop traits. "It's become clear to the whole community that through the genomics revolution, the genetics side of crop breeding is becoming faster and easier, and understanding genetic variance within a crop species is relatively cheap and straightforward.

"But what's still a bottleneck is linking that genetic variance to crop phenotype: performance, yield and quality," he explains. "For the past eight years I've been involved in raising funds to build the Advanced Plant Growth Centre at the James Hutton Institute, a key element of which is a high-throughput

phenotyping platform to reduce the hold up around linking genetic variation to crop performance."

Susan admits she left school with few qualifications and no clear career path, but has since forged a successful role in plant breeding. "I went into nursing after school but it wasn't for me, however, I did enjoy the science behind it. So I went to university to study for a biomedical degree and loved it – it was the first time I'd really stuck my teeth into science and the practical applications for it," she explains.

Assuming she'd work in hospital labs, she instead found a role as a technician on tree species at the Scottish Crop Research Institute, which led to a PhD in raspberries. "It was a different crop entirely and I'd never had a direct interest in it, but I ended up spending three years learning everything about the fruit, marker-assisted breeding and key traits."

From there, she took a job at the James Hutton Institute focusing on blueberries in 2009, undertaking work no one else at the organisation was doing at the time. "I really wanted to make my mark and spent the following 10 years producing cultivars and germplasm, as well as establishing a UK breeding programme for blueberries in 2017 when I became a breeder."

Susan loves that no two weeks are the same. "Plant breeding is seasonal and it brings art into science. There's also the element of looking at the economics of production because the margins are so small. I can see these differences in the cultivars and there's nothing more satisfying than sowing them and seeing them develop.

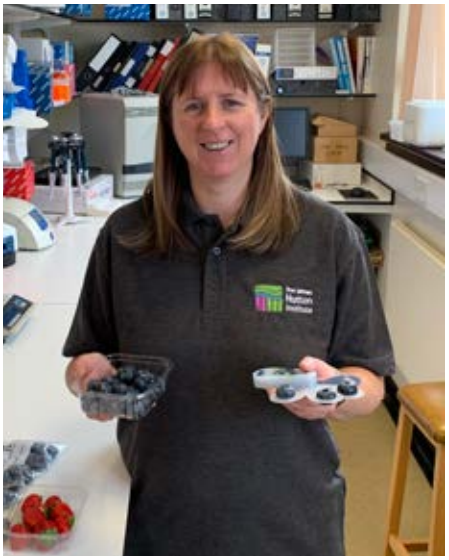
"Plant breeding requires every skill you didn't know you had," she adds. "You have to see potential where no one else would, you must be an engineer, a geneticist, a biologist, be aware of the environment, weather, insects and diseases. If you don't think it's the career for you, chances are there's a niche that you'd enjoy."

Like Susan, one of the most enjoyable aspects of Rachel's career is the variation, be that day-to-day, week-to-week or year-to-year. "Every season is different, there's always something changing and something new to learn, which keeps it interesting and satisfies the part of me that enjoys the research element.

"There's still a lot of fundamental science ▶

Build a network

Attending events such as Cereals can allow new entrants to meet breeders and build a network to help them forge their careers.



From nursing to breeding

Susan McCallum's career started out in nursing which led to a biomedical degree and eventually resulted in her becoming a blueberry breeder at the James Hutton Institute.

happening within industry, whether in-house, through collaborations, with PhD students or through public funding, so it's great to see the progress being made."

Working for Limagrain has also exposed Rachel to a whole panel of experts in their field within plant breeding. "Whether the team member is in R&D, genotyping or plant production, it all feels collaborative, with us all working together to bring varieties to market."

Chirs acknowledges the people he's worked with for helping to shape his career and believes growing a strong network of contacts is not only a highlight, but key to forging a career path. "There's lots to be learnt from engaging with your peers; I wouldn't say it's been my academic qualifications which have helped me succeed but the people around me."

And as Rob's career demonstrates, plant breeding is an international endeavour – pursuing paths within the sector can not only result in international collaboration, but also involvement with projects abroad.

"Being able to study in the US was a great opportunity but it's become more difficult to work and study abroad than it used to be. However, if you get the opportunity, it provides you with a different perspective and understanding. Doing this early in your career also demonstrates to employers that you're flexible and willing to push your career forward."

Another highlight for Rob has been making new scientific discoveries. "I've revisited work I did on potatoes 25 years ago where the project discovered how the plants initially switch how carbohydrates are unloaded into the tubers.

"Very recently we've published another paper detailing one of the proteins we believe is responsible for how these photoassimilates are unloaded. It's great having had a career length that sees your work come back around and advance."

ENGAGEMENT

Chris believes that hosting talks at universities about the seed sector is key to attracting new entrants. "We're our own best advocates but often there's a time and resource issue. Careers talks so often focus on agronomy or land agency but there are so many careers related to plant breeding."

This is something Rachel agrees with, noting not everyone is aware that plant breeding is an industry. "I didn't realise until further into my career path, but with the changing climate and threat to food production, I believe more people will become aware of the efforts within the industry, which could attract new entrants."

Rob feels that a lack of suitable university courses could be hindering new entrants. "A potential answer to this could be more involvement between universities and industry in designing courses, as well as lobbying government to encourage funding to these areas of study."

Chris also believes anyone who's passionate about the seed sector should attend events such as Cereals to help them to build a network. "It's a great opportunity to meet many of the seed breeders and speak to other industry leaders.

"The power of your network is so important, even on the supply side, where you might have to work with your biggest competitor to help you out," he says.

Rachel concurs, observing that building a network is helpful. "Everyone I've met in the industry has been great, so put yourself out there to attend conferences, events and demo days because people are happy to be approached and share their knowledge. Even those working for different companies or in different roles are all working towards the same end goal one way or another."

Rob's advice is to not specialise too early, instead taking a broader approach that avoids closing any doors. "As you progress, you'll achieve a better understanding of what really interests you and it's then that which you pursue. Keep in mind that there's a lot of flexibility in these types of careers and there are options to move sideways."

According to Susan, the best way to start establishing a breeding career is to grow plants. "You'll soon start to recognise what they require and whether they're short on inputs or don't like their environment."

She also stresses the benefits of asking questions: "A simple question can open up a new sphere of thinking, so be inquisitive."

New opportunities

As the plant breeding sector increasingly embraces advancing technologies such as genomic selection and the use of drones, a whole raft of new roles could open up within the industry.