



From lab to field – early experiences of precision breeding

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- adaptive capacity – coping and seizing opportunities
- modularity – ability to operate semi-autonomously, allowing localised responses
- feedback loops – outputs become inputs
- diversity – variety and variability of elements that contribute to multifunctionality

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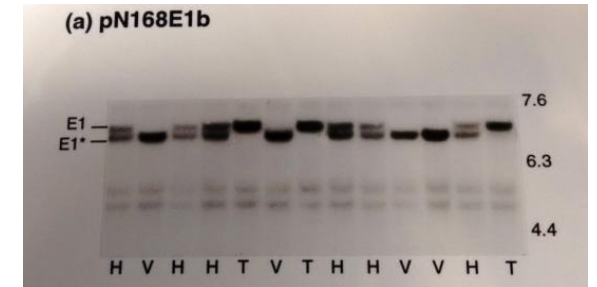


Precision breeding is not a magic bullet, but can be part of a resilient system

Cards on the table: I am a conventional breeder

John Innes Centre 1992-97

Marker-assisted breeding (RFLPs) in oilseed rape



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New Farm Crops / Syngenta Seeds 1997-2006

Assistant Wheat breeder → Senior UK wheat breeder

Switch to marker-assisted, doubled haploid approach



We call it 'the Duxford effect'
Simply the best combination of yield and straw stiffness

- Very high UK treated yield – 2% higher than Alchemy and 3% higher than Gladiator
- Highest yielding second wheat on the HGCA Recommended List 2008
- Excellent resistance to lodging with PGR (R)
- Good all-round disease resistance



Breeding success for farming

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Want a slice of the action?

New Gallant winter wheat. Highest yields plus amazingly consistent Group 1 quality – don't miss out!

- Highest yielding winter wheat on the HGCA Recommended List 2008/09
- 100% UK treated yield (5% higher than Solstice – over 0.5 t/ha more)
- Stable all regions and soil types
- Outstandingly consistent performance across variable seasons
- Very early maturity (similar to Confide)



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Niab

Plant Science into Practice

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Niab 2007-present

Pre-breeding lead

Resynthesis, wide crossing, MAGIC populations in wheat

Rapid pre-breeding pipeline for wheat trait introgression and evaluation

Induced mutations in cereals and legumes

Other projects across other crops



But needs must.....

- My first research project was actually in transgenic tobacco (1991)

But needs must.....

- And my first published paper (1995) was notionally about how marker-assisted breeding will still be needed with transgenic approaches

[Home](#) > [Euphytica](#) > Article

Selecting the optimum genetic background for transgenic varieties, with examples from *Brassica*

Published: February 1995

Volume 85, pages 351–358 (1995) [Cite this article](#)

✓ Access provided by University of Cambridge

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[Derek Lydiate](#), [Phil Dale](#), [Ulf Lagercrantz](#), [Isobel Parkin](#) & [Phil Howell](#)

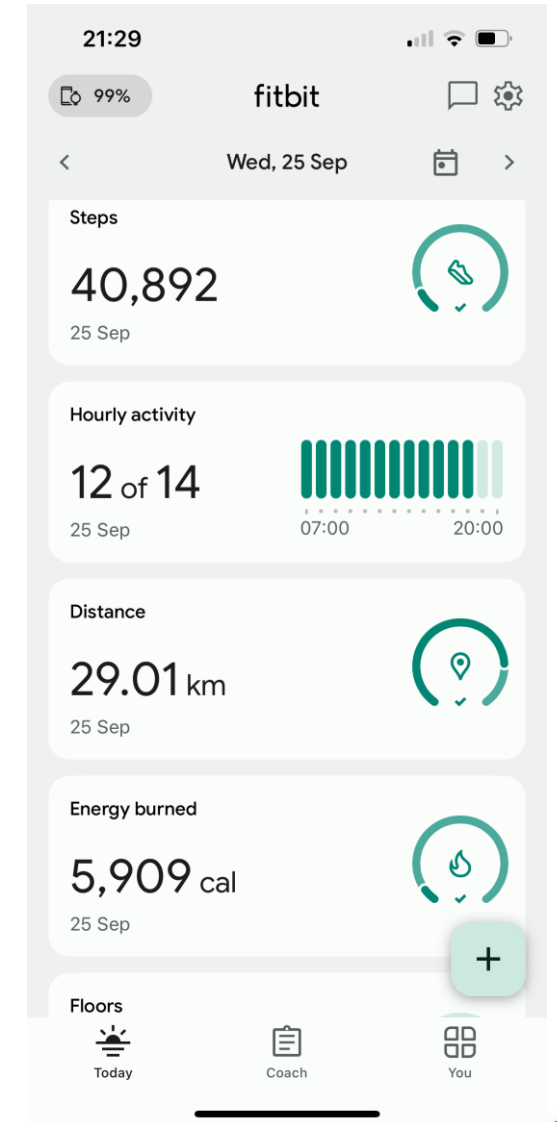
But needs must.....

- As the first to grow it here, I wrote Niab's risk assessment for glasshouse containment of GM Arabidopsis (2021)



But needs must.....

- I took on Niab's GM potato field trials for TSL in 2023, plus further GM (2024) and cisgenic QHP trials (2025, 2026)....



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-GM spring wheat sub-contractor trials (2025, 2026)



But needs must.....

- I now sit on Niab's Biosecurity / GMSC and find myself increasingly drawn into precision breeding advocacy



Academics say

- “Gene editing is quicker and more efficient because all you alter is one gene”

Breeders think

- “Gene editing is quicker and more efficient because all you alter is one gene”
- Then you are creating a new variety that is likely to fail DUS testing, so we can't sell that
- Even if we get round DUS, it will be essentially-derived from the parent variety, so we can't protect the new variety for as long and will have to reach an agreement with the owner of the original variety
- And yes, you might be improving your target trait, but the ~~Holy Bible~~ Breeders' Equation clearly shows sustained genetic gain requires new crossing and selection cycles or everything else becomes stagnant
- So actually, you need to combine gene editing with crossing and selection – edit the parent you would otherwise have made a cross with

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Breeders think

- “Gene editing is so democratic and accessible”
- Precision-breeding is technically far from trivial for many crop species
- For many legumes, regeneration of the transgenic intermediate is only possible through micrografting transformed shoots onto regular rootstocks – hardly suitable for the numbers game breeders have to play
- Even in amenable species the efficiencies are often far lower in elite varieties than model genotypes
- The IP landscape is largely ignored by academics but represents a minefield for commercial applications
- Regulations and definitions differ across territories, but plant breeding is largely a multinational industry – if I’m investing in precision breeding I probably can’t afford to target just one territory

My pretentious conclusion



If I started out thinking

“I disapprove of the hype about GM and gene editing, but I will defend to the death your right to use it” (paraphrasing Voltaire)

* actually writer Evelyn Beatrice Hall, summarising Voltaire’s views on free speech

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This has now evolved over time to something more like

“I hope I can combine a degree of pragmatic scepticism with some genuine enthusiasm for the opportunities offered by precision breeding, as part of an integrated approach to crop improvement”



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