

ISTA ANNUAL MEETING

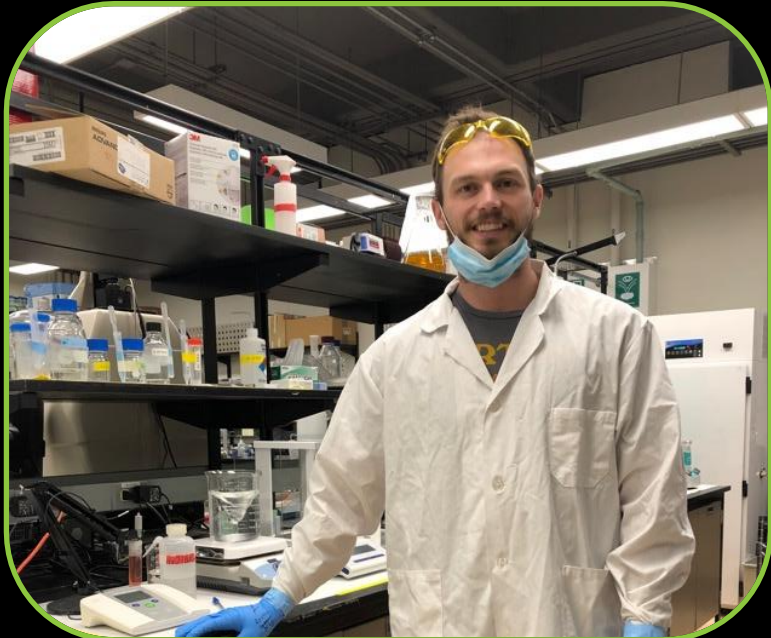
Breeding for a Changing Canada: Innovation for Stress Resilience

A trait developer's perspective on
climate resilience, breeding, genome
editing, and the role of seed testing

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Why this problem matters to me



Climate change is increasing risk for canola



Canada's agricultural advantage is changing with climate.

Source: Rabobank Research, May 2026

1



Largest warming is occurring in winter

Earlier springs, longer falls, and milder winters

2



More +30°C summer days

Higher drought frequency and lower soil moisture

3



Heat >28°C reduces flowering and seed set

Reproductive stress directly pressures yield



Canada's warming climate creates a clearer need for canola genetics that improve **stress resilience** and **seasonal adaptation**.



DEMAND IS GROWING, YIELDS ARE UNDER PRESSURE

Hotter weather is limiting canola crop yields



2000 - 2016

Yields climbed ~60% through hybrid breeding and traits.



2016 - 2024

Yields flatline despite intensive breeding. Water stress and heat are major culprits.



Abiotic Stress - Heat

Daytime temperatures during flowering (>28°C) reduce seed set and yield.

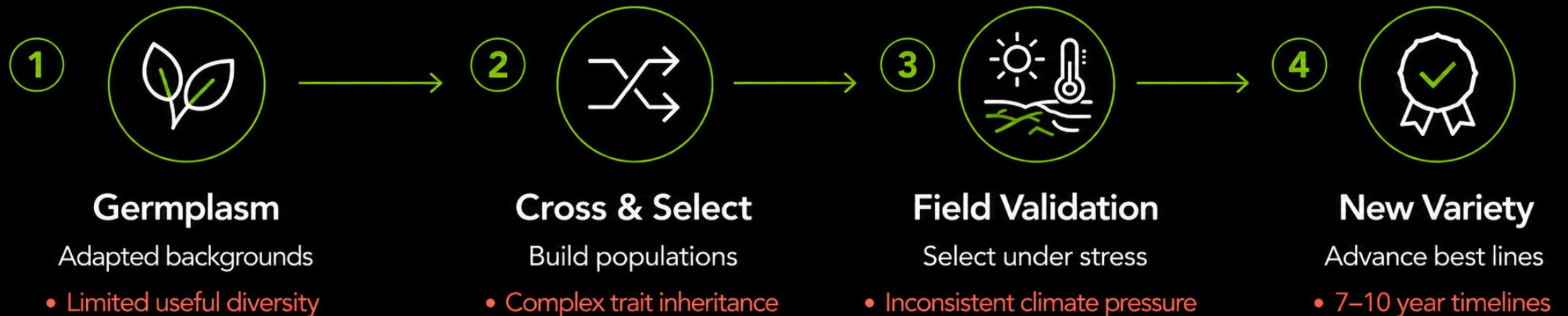
Canadian canola yield, 2000–2025

Average annual yield (bu/ac)



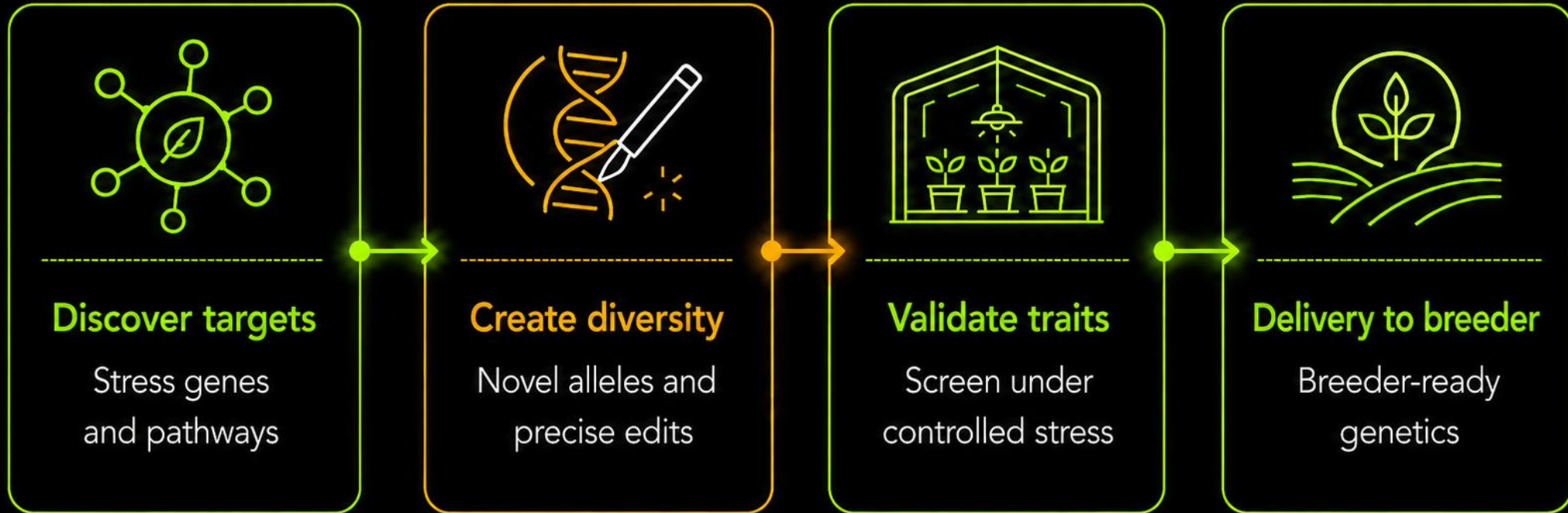
Canola Council of Canada / Statistics Canada

Breeders translate genetic diversity into performance



Breeding remains the route to the field — but trait development expands the pool of genetic diversity and traits breeders can deploy.

Trait developers create diversity for breeders to deploy



Trait innovation creates new genetic options – collaboration turns them into field ready varieties.

STRONGER TOGETHER

Breeders and trait developers create more together



AgGene's role is to generate and validate new trait diversity that breeders can deploy in adapted germplasm

Our Mission

Deliver next-generation traits that **protect yield** and **expand production** in a **changing climate.**



Building climate resilience traits

DISCOVERY & TARGET ACCESS



Internal discovery

AgGene-led target discovery in climate resilience biology



Mendel Biotechnology

In-licensed gene targets with supporting data for climate stress tolerance



genXtraits

In-licensed gene targets with supporting data for climate stress tolerance

TRAIT DEVELOPMENT ENGINES



Genome editing

Rapid target validation
Precise allele creation
Proof-of-concept trait development



Mutagenesis

Allele discovery
Natural variation
Non-GMO

CLIMATE RESILIENCE TRAIT FOCUS



Heat tolerance



Drought tolerance

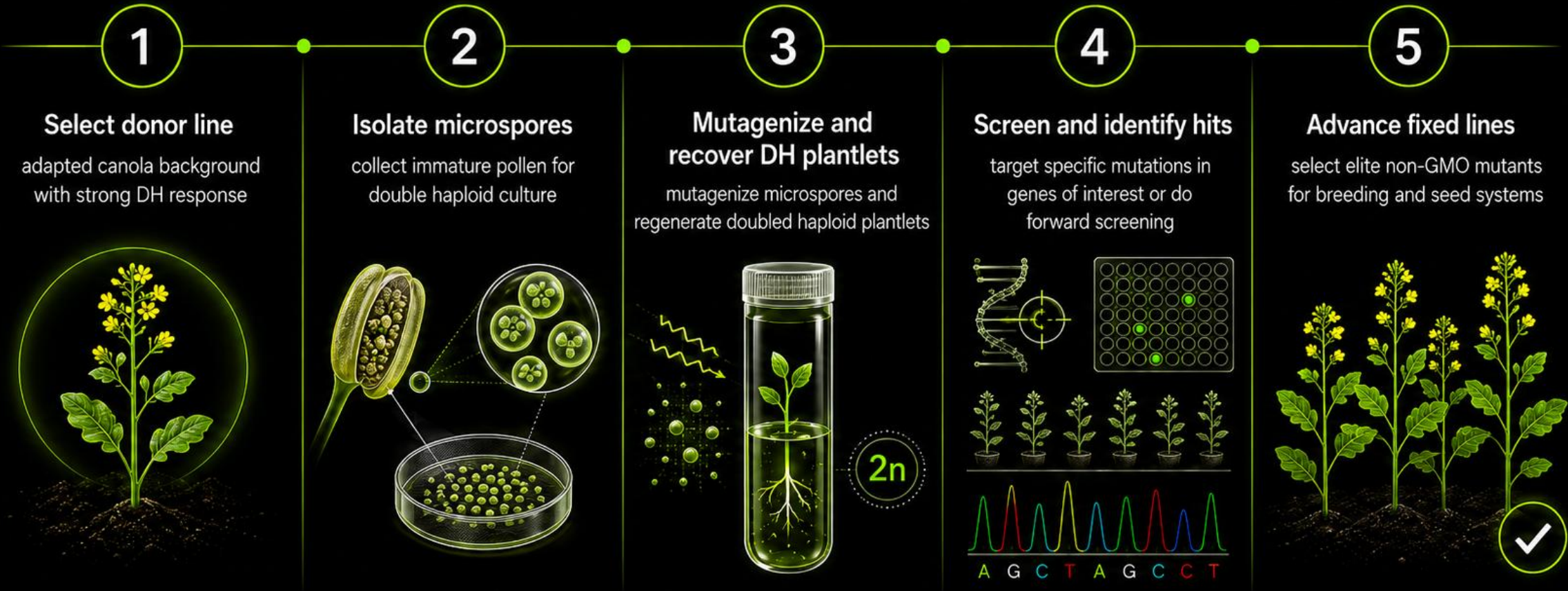


Frost / cold tolerance

OUTPUT

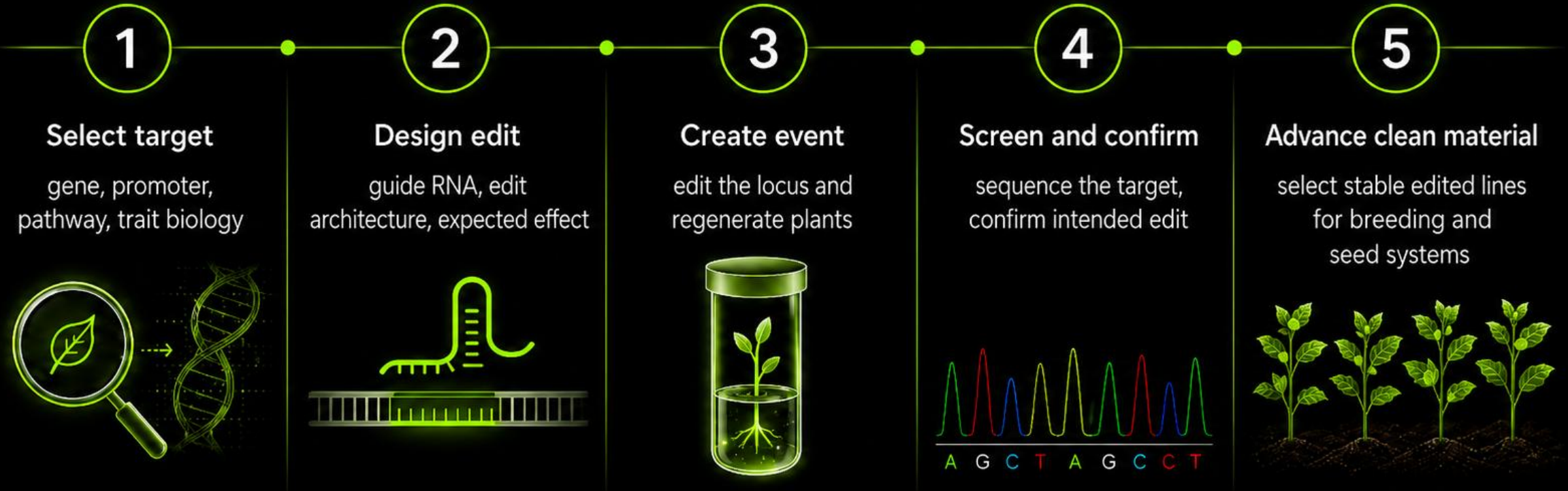
Novel genetic diversity
Breeder-ready trait options
Traits that can be deployed into adapted germplasm

Canola mutagenesis workflow to advance stress traits



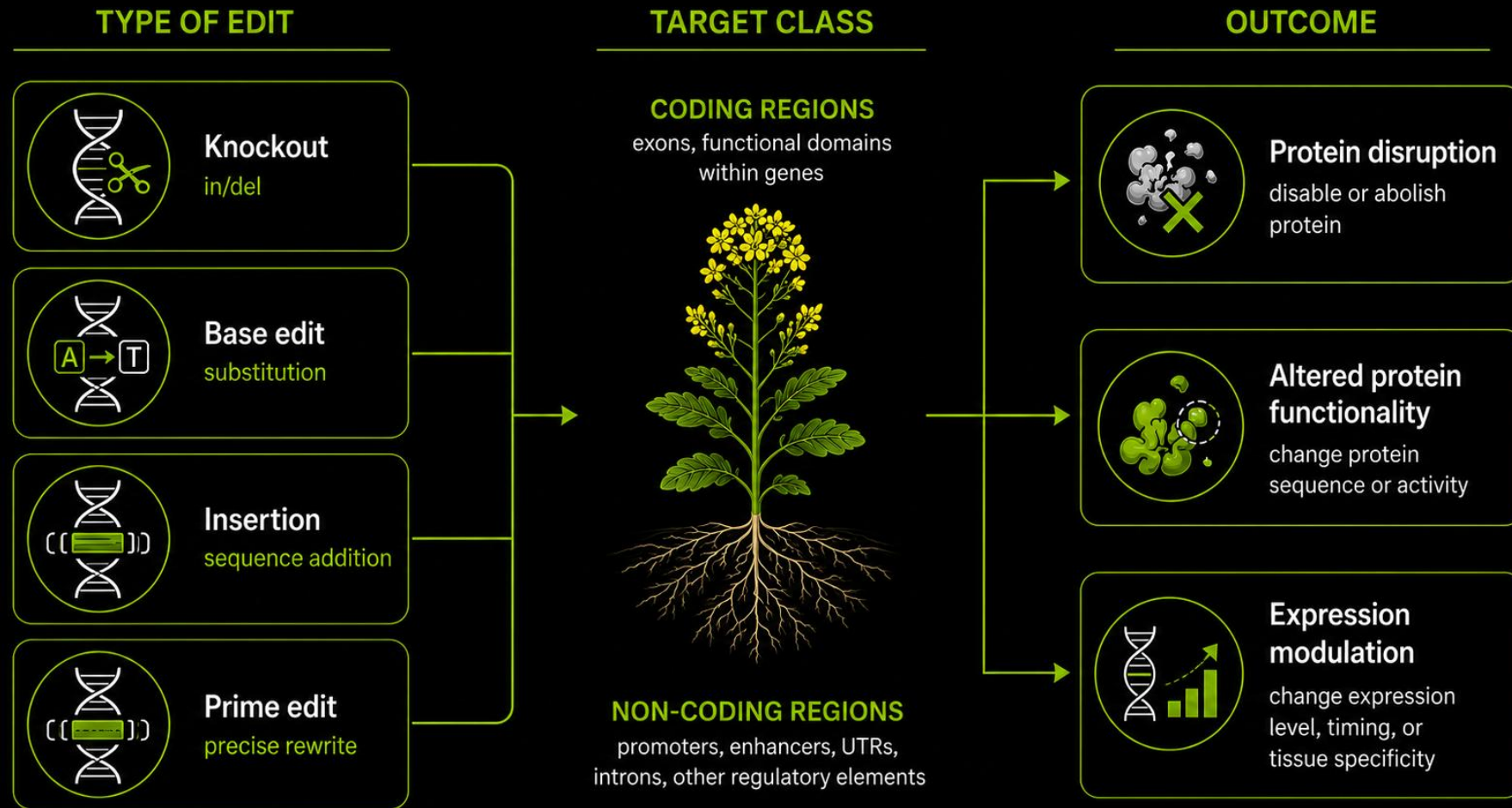
Generate wide array of diversity, but requires intensive breeding efforts to minimize background mutations

Canola gene editing workflow to advance stress traits



Can make precise changes directly in elite germplasm, often limited by tissue culture and plant recovery

Editing strategies drive trait and product design



Different edit architectures create different testing requirements

Multiple testing checkpoints on commercial pathways



1

Trait identity

- Confirm intended edit
- Verify allele / zygosity
- Check lot consistency

Typical methods

PCR, sequencing, KASP, ddPCR, targeted amplicon NGS



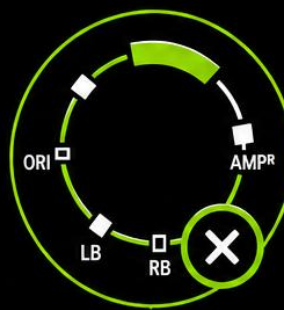
2

Seed quality

- Assess germination
- Evaluate vigour
- Confirm key quality traits

Typical methods

Germination tests, vigour assays, phenotypic evaluation



3

Backbone DNA

- Check for backbone and Cre-lox sequences
- Confirm no marker cassette remains
- Verify clean events

Typical methods

PCR, ddPCR, targeted NGS



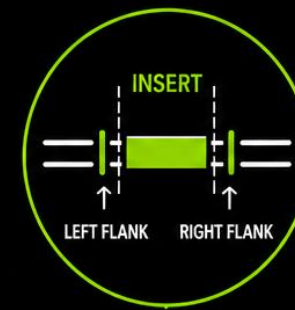
4

Off-target review

- Assess predicted risk
- Check top sites when relevant
- Testing depth is risk-based

Typical methods

In silico review, targeted amplicon sequencing, deep sequencing



5

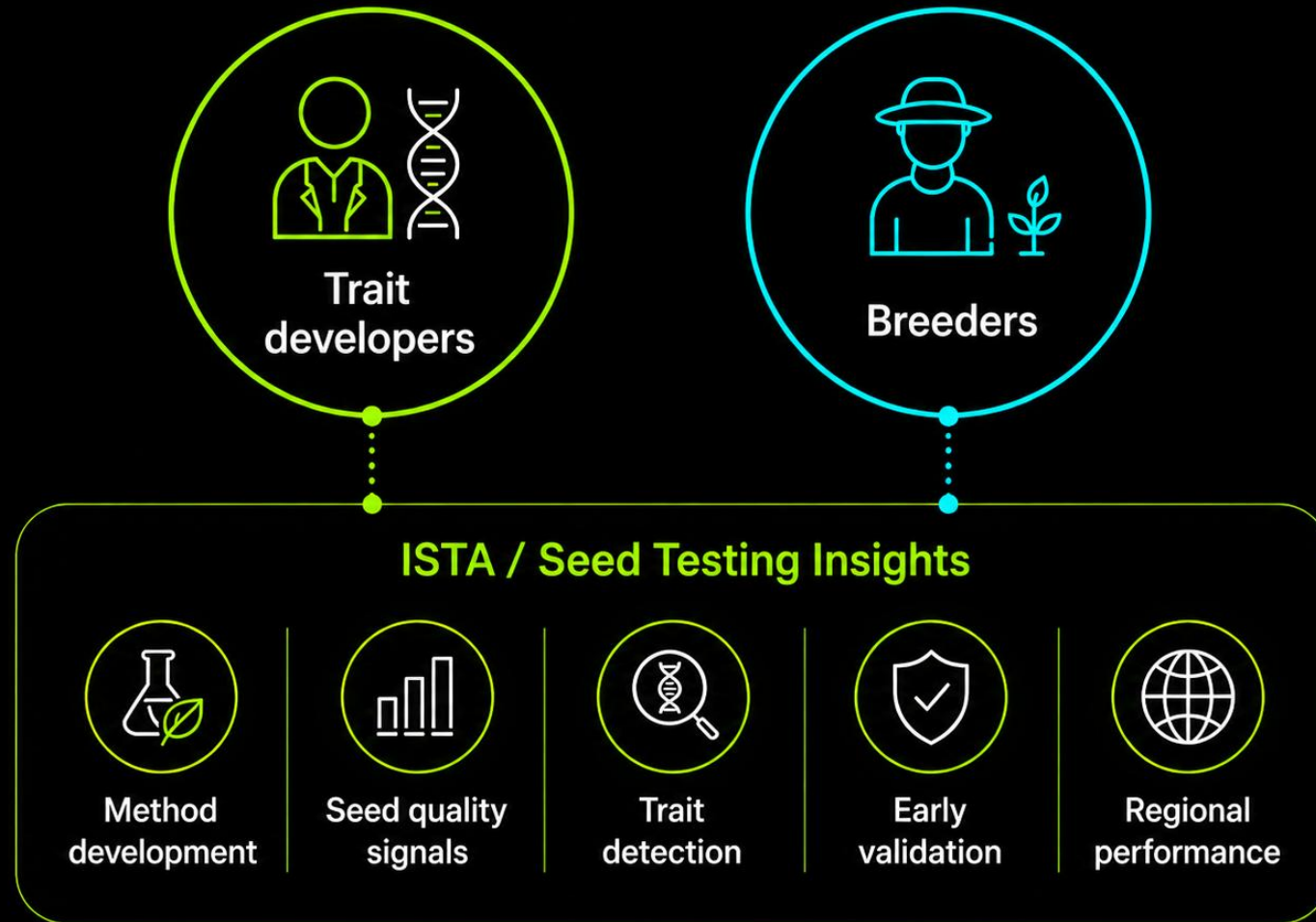
Insertion structure

- For insertions or replacements
- Confirm copy number and orientation
- Verify junctions and completeness

Typical methods

NGS sequencing, PCR detection

Breeder and trait developer interactions with ISTA labs



ISTA can help move testing earlier in the trait pipeline — supporting method development, trait detection, seed quality insights, and breeder-ready confidence



AgGene

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