irc 2023

irc 2023 SYDNEY

16th INTERNATIONAL RAPESEED CONGRESS
24 - 27 September 2023

GLOBAL CROP - GOLDEN OPPORTUNITIES

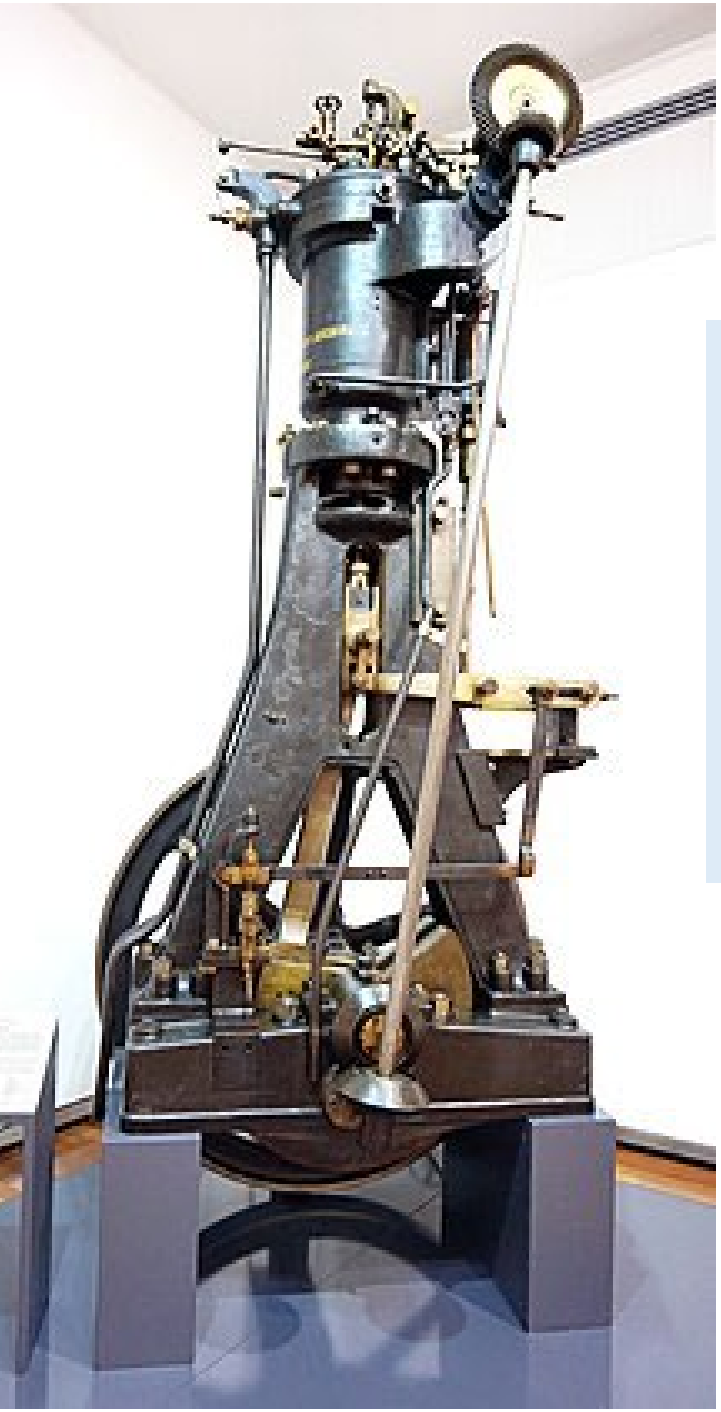
The Innovative Oilseed

Feeding and fuelling a growing world: sustainably

Maurice Moloney, Managing Partner, AgritecKnowledge

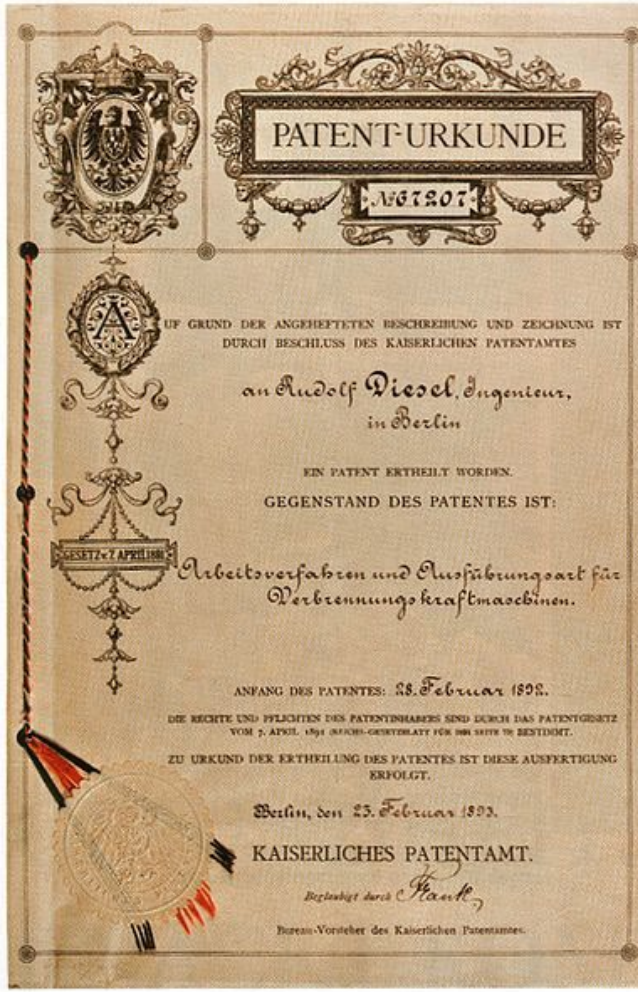
nuSEED®

AgritecKnowledge
Growing innovation in your field



Rudolf Diesel's innovation and vision

"The use of vegetable oils for engine fuels may seem insignificant today. But such oils may become in course of time as important as petroleum and the coal tar products of the present."



PATENT-URKUNDE

№ 67207

AUF GRUND DER ANGEHEFTETEN BESCHREIBUNG UND ZEICHNUNG IST DURCH BESCHLUSS DES KAISERLICHEN PATENTAMTES

an Rudolf Diesel, Ingenieur, in Berlin

EIN PATENT ERTHEILT WORDEN.

GEGENSTAND DES PATENTES IST:

Arbeitsverfahren und Ausführungsart für Verbrennungskraftmaschinen.

ANFANG DES PATENTES: 28. Februar 1892.

DIE RECHTE UND PFLICHTEN DES PATENTINHABERS SIND DURCH DAS PATENTGESETZ VOM 7. APRIL 1891 (REICHS-GESETZBLATT FÜR 1891 SEITE 79) BESTIMMT.

ZU URKUND DER ERTHEILUNG DES PATENTES IST DIESE AUSFERTIGUNG ERFOLGT.

Berlin, den 23. Februar 1893.

KAISERLICHES PATENTAMT.

Beglaubigt durch Frank

Bureau-Vorsteher des Kaiserlichen Patentamtes.

AgritecKnowledge

Growing innovation in your field

UNITED STATES PATENT OFFICE.

RUDOLF DIESEL, OF BERLIN, GERMANY.

METHOD OF AND APPARATUS FOR CONVERTING HEAT INTO WORK.

SPECIFICATION forming part of Letters Patent No. 542,846, dated July 16, 1895.

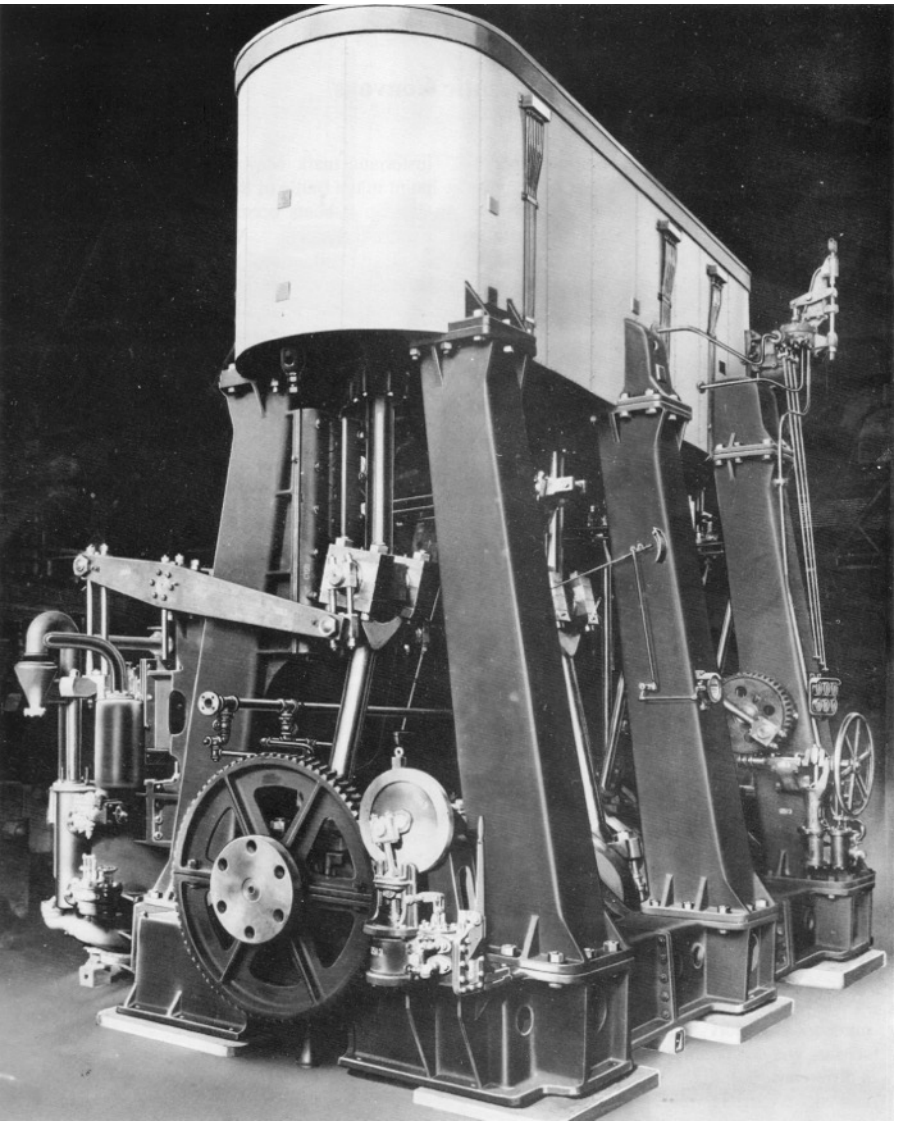
Application filed August 26, 1892. Serial No. 444,246. (No model.) Patented in Germany February 28, 1892, No. 67,207; Switzerland April 2, 1892, No. 5,221, and in England April 14, 1892, No. 7,241.

Rapeseed was first introduced into Canada from Poland in 1936. But because of oil shortages during World War II, *Brassica rapa* seeds were tested along with *B. napus* seeds of Argentinian origin and grown under contract in the Province of Saskatchewan.

AgritecKnowledge

Growing innovation in your field

Steam Powered Liberty Ships and High-Erucic Rapeseed Oil



Between 1943 and 1948 with a government-guaranteed price of $.06/lb production expanded from a few acres to 79,000. When the price support was withdrawn rapeseed acreage declined dramatically

1950-1960: Saved by Tempura

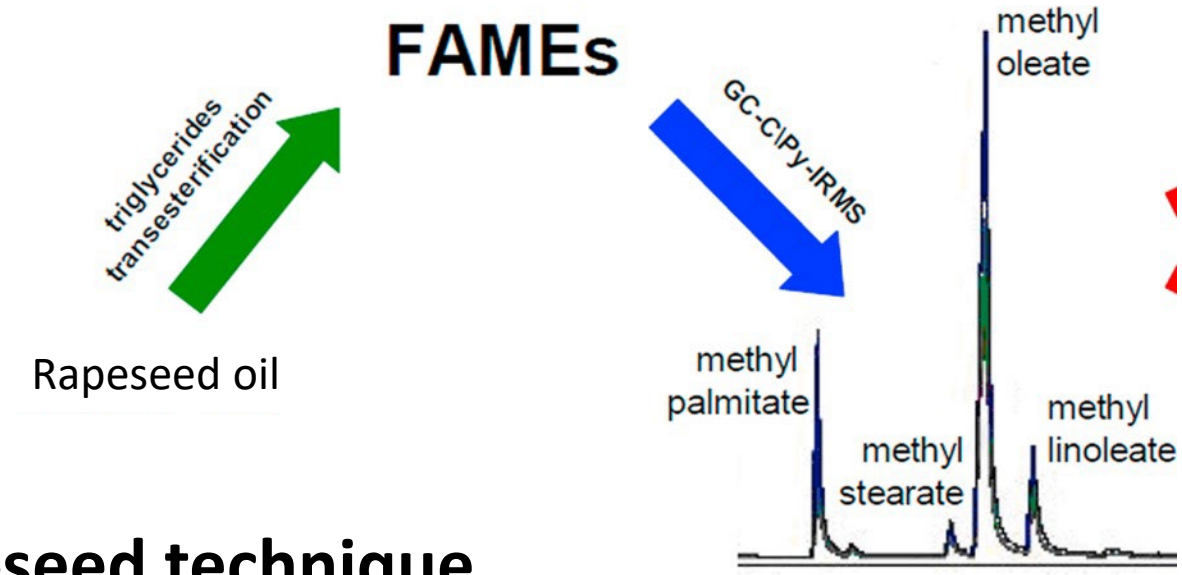
AgritecKnowledge

Growing innovation in your field

Innovation and the creation of Canola in the 1960s

Downey and Steffanson brought ***high-throughput screening*** to plant breeding

Screening for low Erucic Acid oil



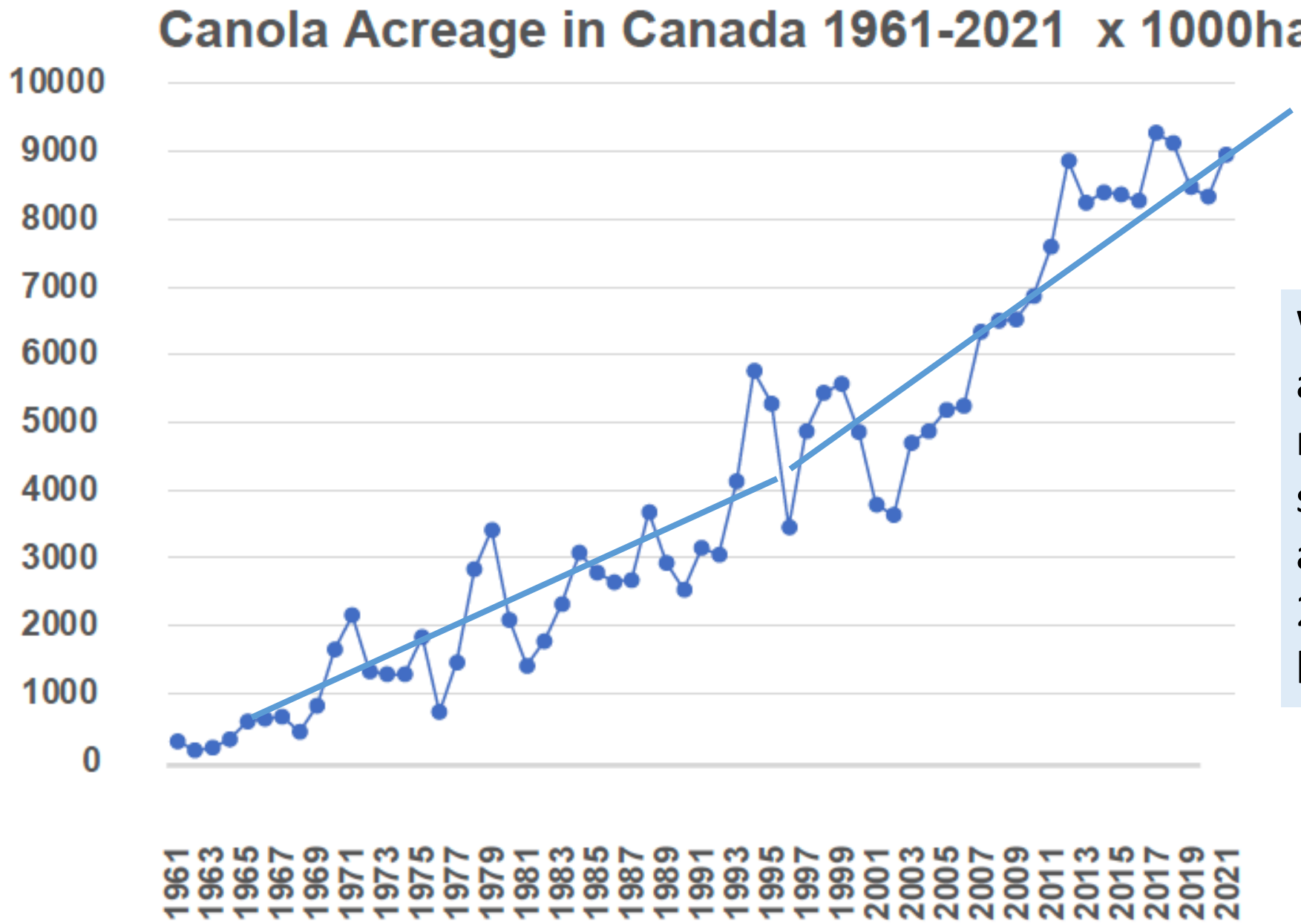
Half-seed technique

AgritecKnowledge
Growing innovation in your field

Rapid screening for low glucosinolate rapeseed

Glucosinolate-minus seeds were identified using diabetic testing tape

AgritecKnowledge
Growing innovation in your field



With the removal of erucic acid and glucosinolates, markets and acreages soared. In 2000, Canola was asserted as GRAS and in 2018 FDA allowed specific health claims

AgritecKnowledge
Growing innovation in your field

Transgenic Brassica plants change the game

High efficiency transformation of *Brassica napus* using *Agrobacterium* vectors

Maurice M. Moloney, Janis M. Walker, and Kiran K. Sharma

Department of Biological Sciences, University of Calgary, Calgary, Alberta T2N 1N4, Canada

Received April 6, 1989/Revised version received May 19, 1989 – Communicated by F. Constabel

Plant Cell Reports

US005463174A

United States Patent [19]

Moloney et al.

[11] **Patent Number: 5,463,174**

[45] **Date of Patent: * Oct. 31, 1995**

[54] **TRANSFORMATION AND FOREIGN GENE EXPRESSION IN BRASSICA SPECIES**

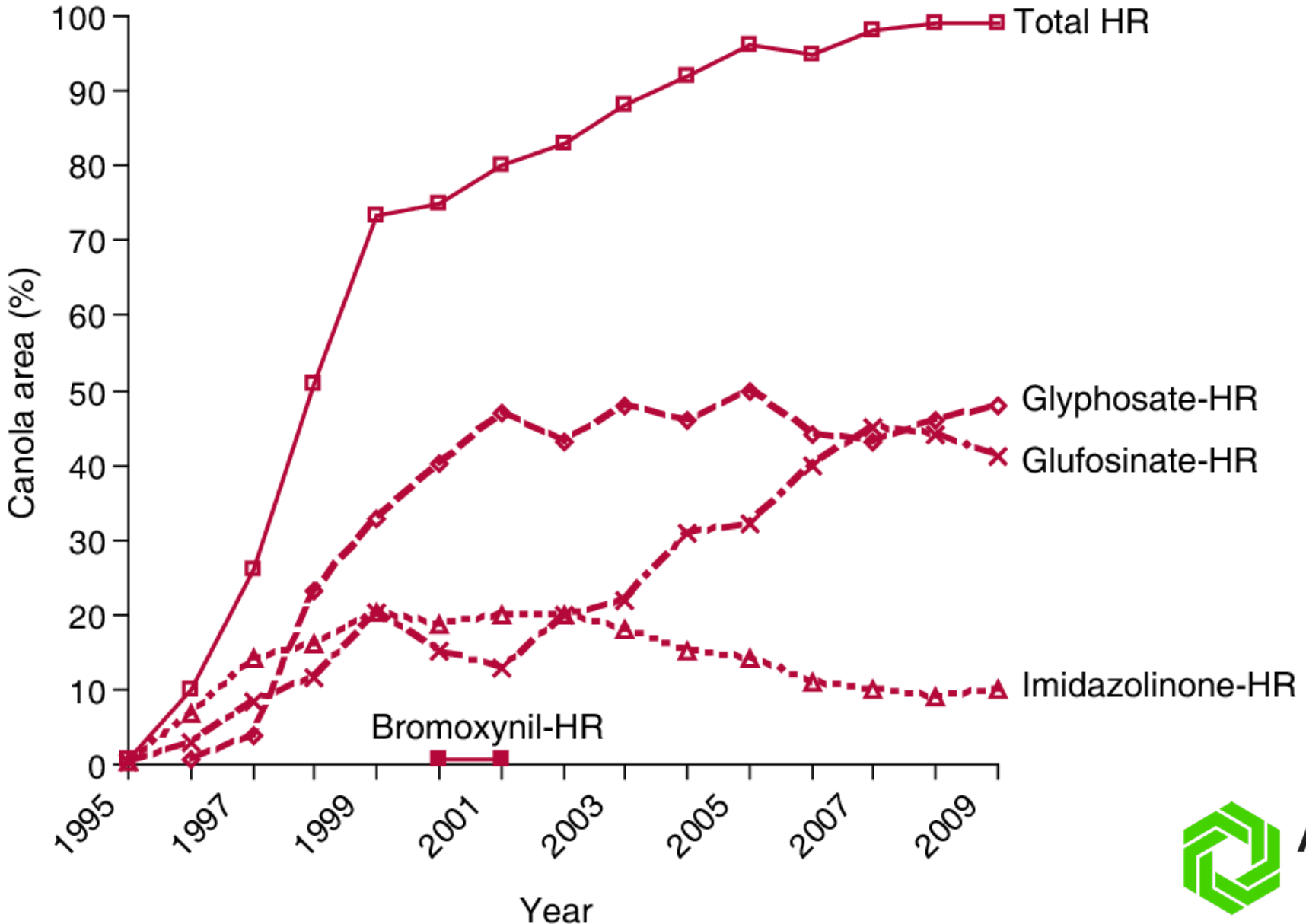
[75] Inventors: **Maurice M. Moloney**, Calgary, Canada; **Sharon Radke**, Davis, Calif.

(1986) pp. 35–36.

Pua et al., "Transgenic Plants of *Brassica napus* L." *Bio/Technology* (1987) 5:815–817.

Fry et al., "Transformation of *Brassica napus* with *Agrobacterium tumefaciens* based vectors." *Plant Cell Reports*

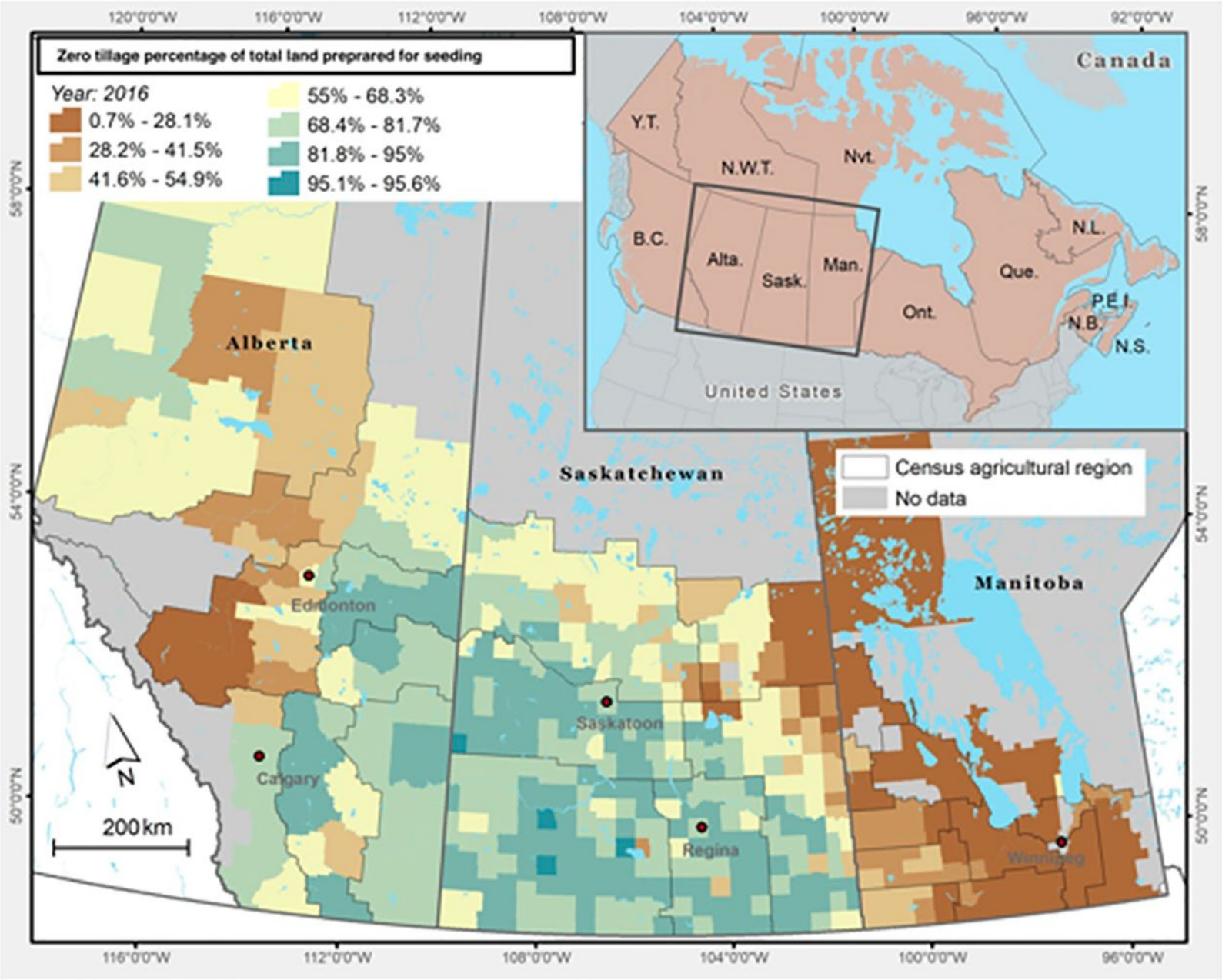
Adoption Rate of Herbicide Tolerant Canola



AgritecKnowledge

Growing innovation in your field

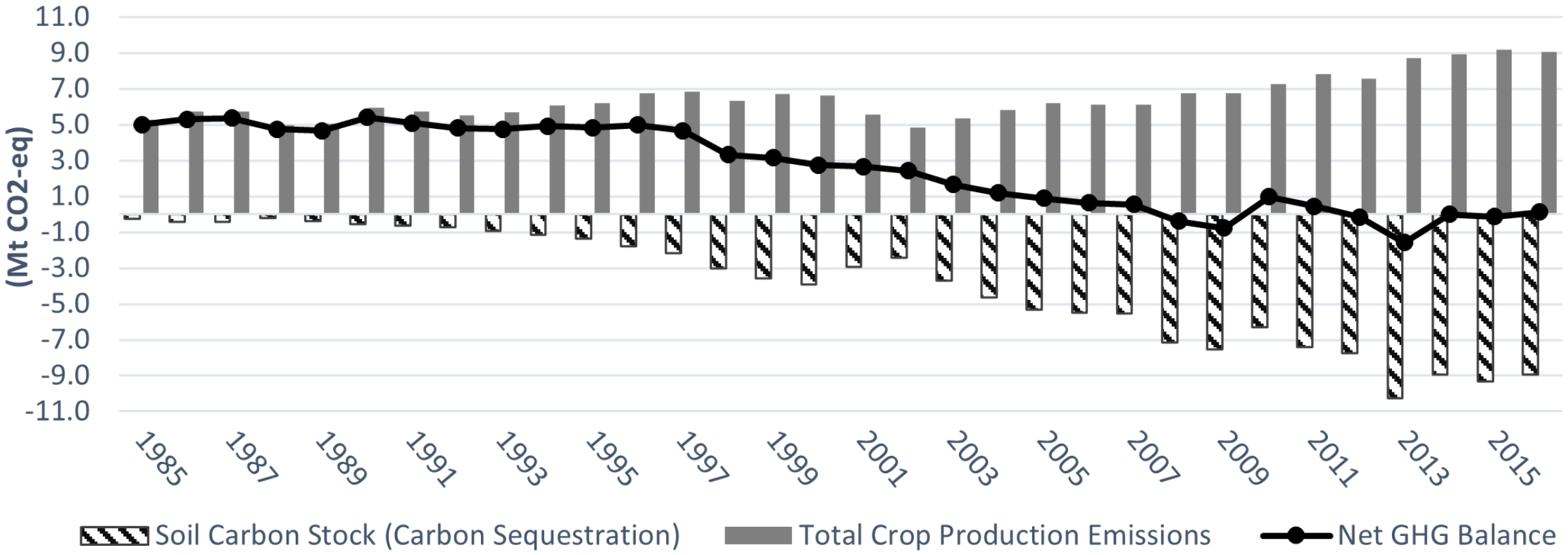
HT-Canola and no-till agriculture in Western Canada



AgritecKnowledge

Growing innovation in your field

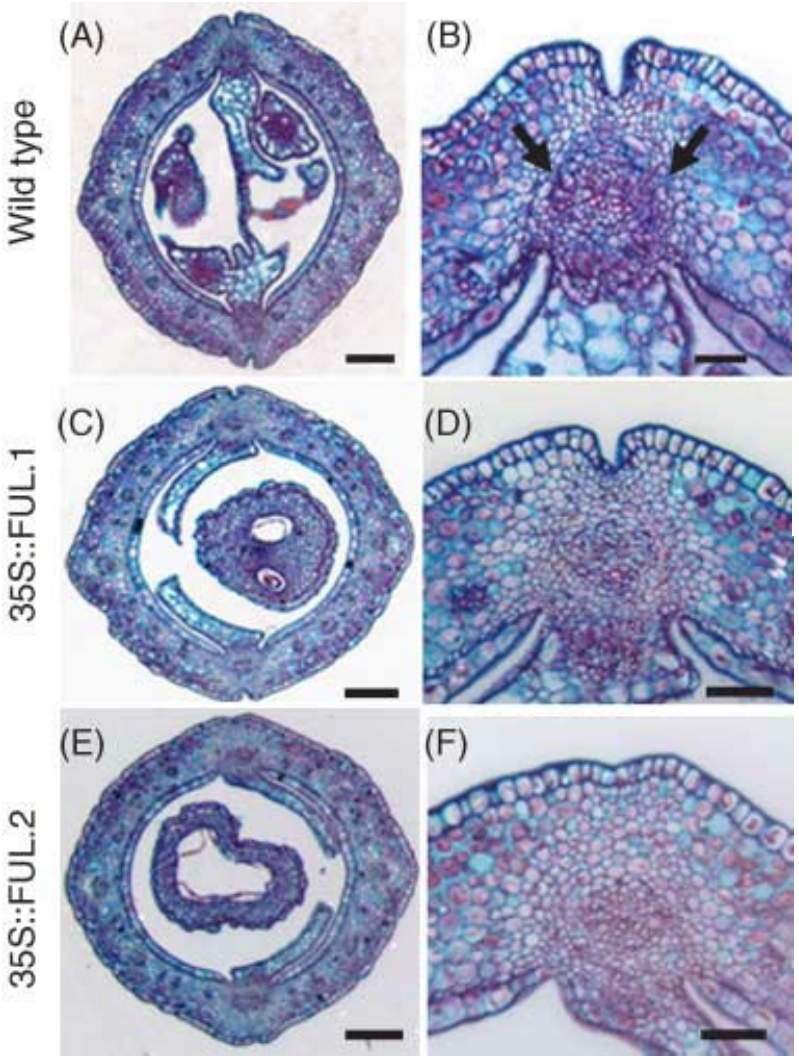
Effect of adoption of no-till on GHG emissions balance: Saskatchewan



Saskatchewan GHGs estimates in the crop sector (Mt CO2-eq) (1985–2016).

AgritecKnowledge
Growing innovation in your field

Low shattering Brassica siliques: the *Fruitfull* gene



Low shattering Canola not only improves yield, but provides flexibility on harvesting (swathing or straight combining) as well as helping to minimize green seed.
>$100M annually

AgritecKnowledge
Growing innovation in your field

Omega-3 Canola

High value long-chain Omega-3 oils in Canola: Aquaterra

$18:1^{\Delta 9}$
Oleic acid, OA

Δ12-des ↓

$18:2^{\Delta 9,12}$
Linoleic acid, LA

Δ15-des ↓

$18:3^{\Delta 9,12,15}$
α-Linolenic acid, ALA

Δ6-des ↓

$18:4^{\Delta 6,9,12,15}$
Stearidonic acid, SDA

Δ6-elo ↓

$20:4^{\Delta 8,11,14,17}$
Eicosatetraenoic acid, ETA

Δ5-des ↓

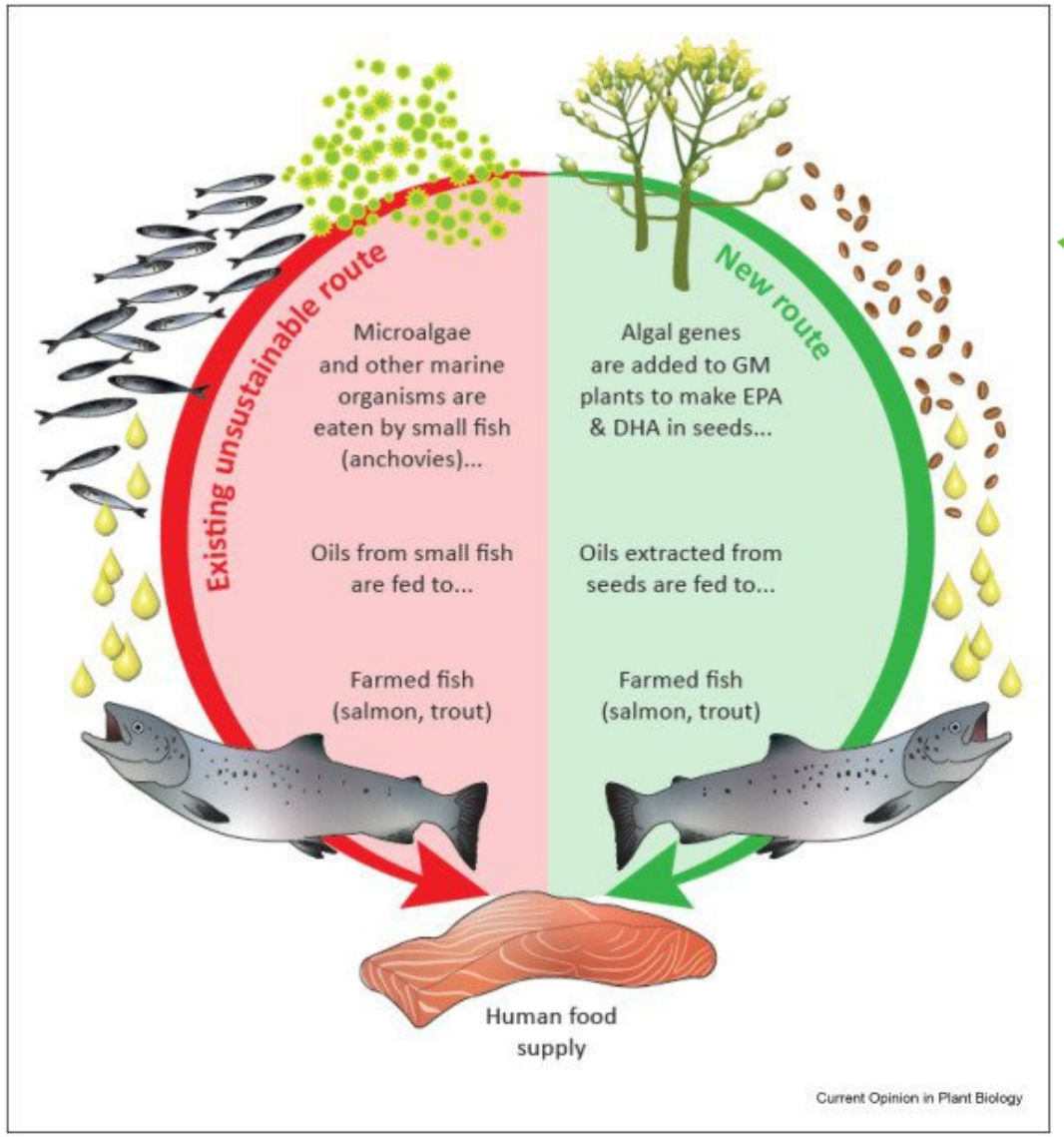
$20:5^{\Delta 5,8,11,14,17}$
Eicosapentaenoic acid, EPA

Δ5-elo ↓

$22:5^{\Delta 7,10,13,16,19}$
Docosapentaenoic acid, DPA

Δ4-des ↓

$22:6^{\Delta 4,7,10,13,16,19}$
Docosahexaenoic acid, DHA



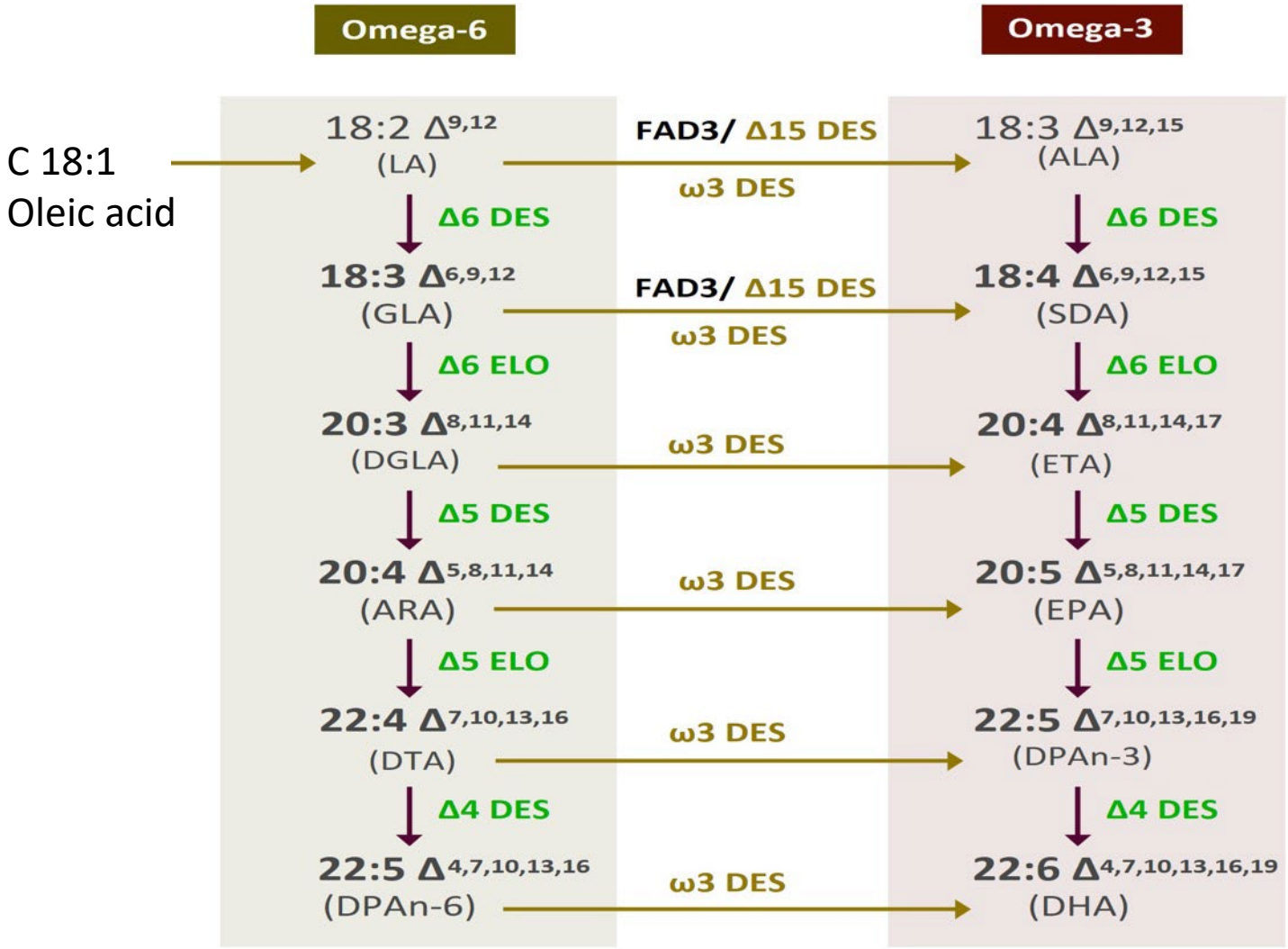
Source: Napier and Betancor (2023).

CSIRO

nuSEED®

AgritecKnowledge
Growing innovation in your field

High value long-chain Omega-3 oils in Camelina



ROTHAMSTED RESEARCH

Source: Using field evaluation and systematic iteration to rationalize the accumulation of omega-3 long-chain polyunsaturated fatty acids in transgenic Camelina sativa

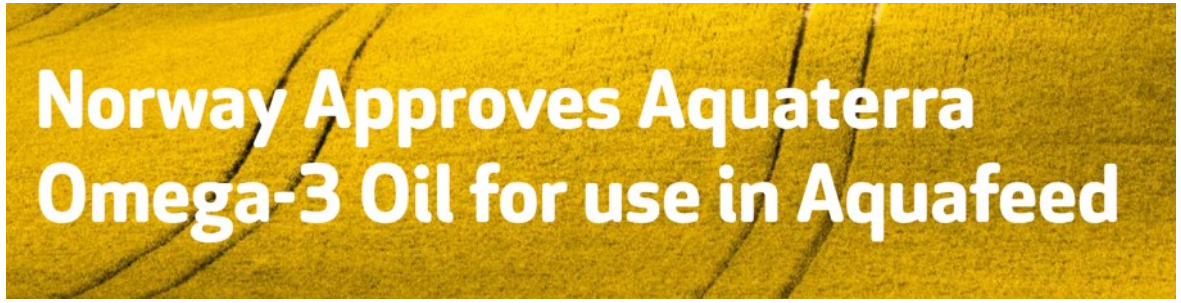
Plant Biotechnology Journal, Volume: 20, Issue: 9, Pages: 1833-1852, First published: 02 June 2022, DOI: (10.1111/pbi.13867)

Critical Approvals for plant-bases long-chain Omega-3 oils

ATLANTIC SALMON | FEED INGREDIENTS | FEED FORMULATION +4 more

3 July 2023, at 8:00am

Aquaterra omega-3 oil approved for use in aquafeed



Announcement

The Norwegian Food Safety Authority approves Aquaterra® rapeseed oil from genetically modified rapeseed for use in fish feed

Published 28/06/2023 Last changed 29/06/2023 Print

Nutriterra – The world's first plant-based source of total omega-3 nutrition, including DHA+EPA and ALA.

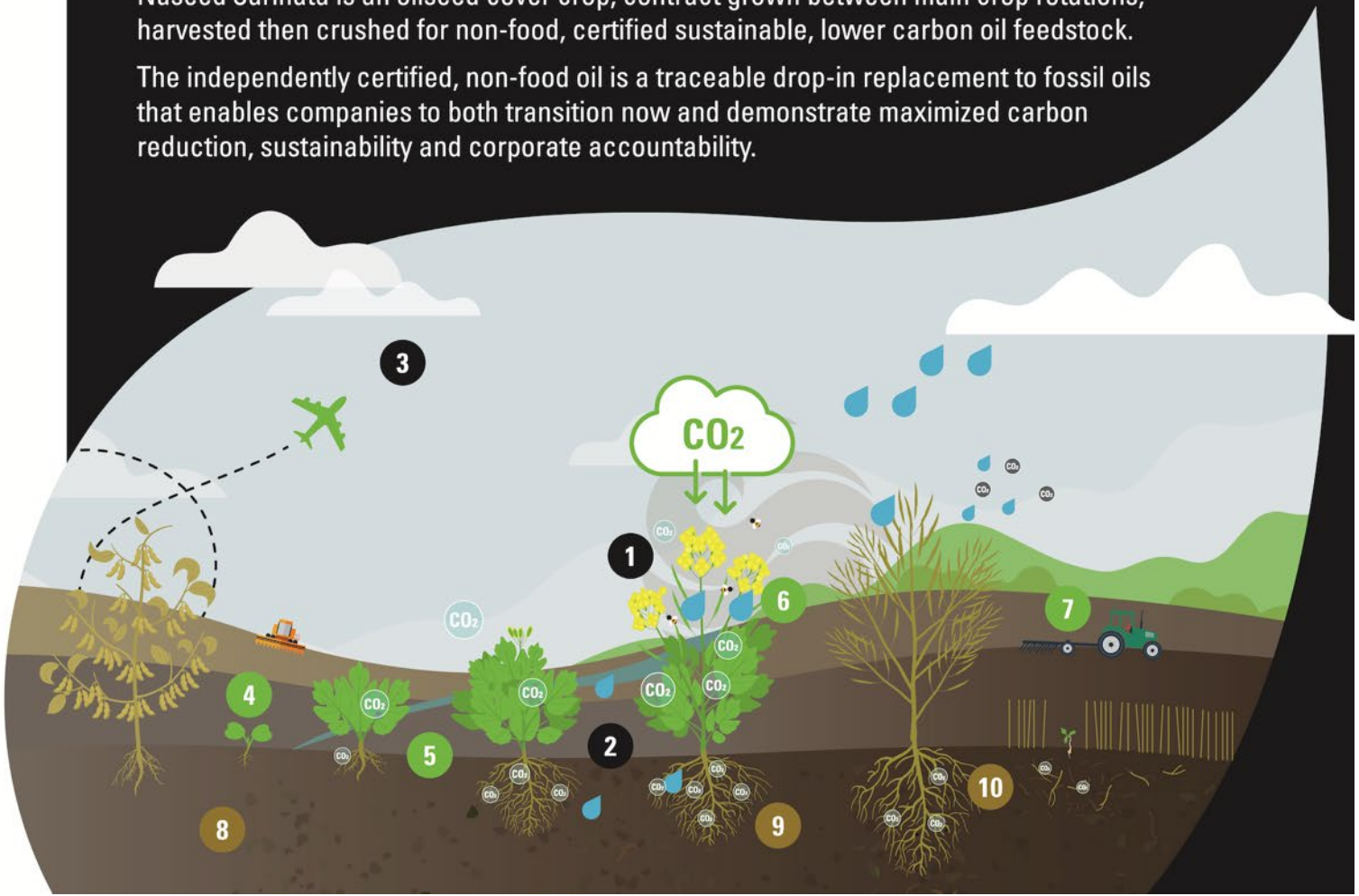
Fulfilling Rudolf Diesel's vision

nuSEED CARINATA

CERTIFIED SUSTAINABLE PRODUCTION

Nuseed Carinata is an oilseed cover crop, contract grown between main crop rotations, harvested then crushed for non-food, certified sustainable, lower carbon oil feedstock.

The independently certified, non-food oil is a traceable drop-in replacement to fossil oils that enables companies to both transition now and demonstrate maximized carbon reduction, sustainability and corporate accountability.



nuSEED CARINATA

INCREASES CARBON SAVINGS

1. Removes atmospheric carbon and restores it to regenerate soil health
2. Reduces carbon loss
3. Reduces emissions, drop-in replacement for fossil oils

REWARDS SUSTAINABLE PRACTICES

4. Low tillage, low nitrogen, low inputs
5. Prevents erosion
6. Increases crop diversity (bee habitat, disease prevention, weed suppression)
7. Protects water, natural areas and no indirect land use change

REGENERATES SOIL

8. Incentives for natural fertilizer soil benefits
9. Decompaction, increases moisture and nutrient retention
10. Increases above and below ground biomass

Benefits of renewable biofuels from *Brassica carinata*

nuSEED® CARINATA

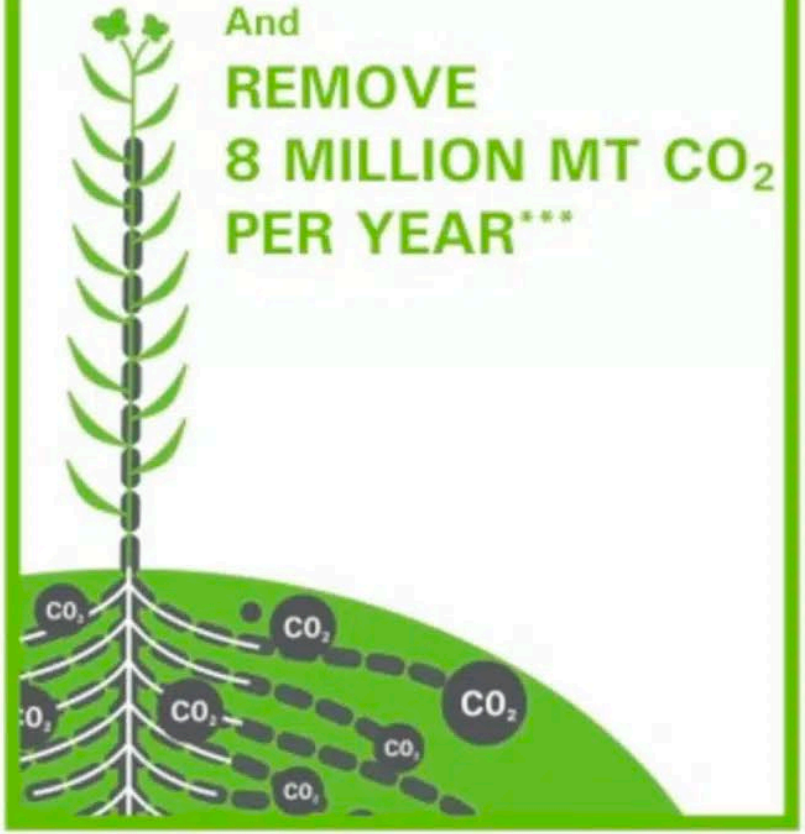
There's over
170 MILLION HECTARES*
that can benefit from cover crops

By planting only
1.5% of those hectares to Nuseed Carinata

Without displacing primary food crops or requiring additional farmland

We could grow feedstock for
1 BILLION GALLONS
sustainable aviation fuel (SAF) annually from 2030**

And
REMOVE 8 MILLION MT CO_2 PER YEAR***



Innovation in Brassicaceae is protecting soil while providing sustainable biofuels

Using Pennycress (Thlaspi arvense) as a cover crop and biofuel source:

CoverCress Inc

Using Camelina sativa as a cover crop and biofuel source:

Yield10 Inc

Global Clean Energy Holdings

irc 2023

irc 2023 SYDNEY

16th INTERNATIONAL RAPESEED CONGRESS
24 - 27 September 2023

GLOBAL CROP - GOLDEN OPPORTUNITIES

The Innovative Oilseed

continues to innovate….

nuSEED®

AgritecKnowledge

Growing innovation in your field