



Breeding of oilseed rape and pulses for feed and food

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Background

- Norddeutsche Pflanzenzucht (NPZ) is a family owned plant breeding company with a history of breeding since 1892
- Today we are a leading company in breeding of winter and spring oilseed rape world wide and pulses (combining peas and fababeans)
- In rapseed we are producing certified seed of our varieties in close cooperation with DSV Lippstadt (Rapool-Ring)
- Overall 240 coworkers on 2 locations including significant breeding research
- Dr. O. Sass : responsible for the breeding of spring oilseed rape worldwide and pulses

The 2 challenges in rapeseed breeding

- **1. FOOD – vegetable oil**

Erucic acid C22:1

- In old ++ type varieties > 50 %
- Goal: < 1 %, effectively < 0 %

- **2. FEED – rapeseed extraction meal**

Glucosinolates

- In old ++ or +0 type varieties > 70 -100 μ mol GSL/g seed
- Goal: as low as possible, min < 18 μ mol GSL/g seed

Milestones in rapeseed breeding: towards 0- and 00-quality/ 1

1897	Hans Lembke – starting breeding of winter rape (++)
1960	<i>Stefansson und Downey</i> – Erucic acid free mutants (0) in variety LIHO
1966	Göttinger Arbeitskreis Qualitätsraps
1969	<i>Lein, Krzymanski</i> – low glucosinolate mutants (00) in variety BRONOWSKI, in Canada established as CANOLA
1973	First winter rape variety LESIRA with +0-quality

Today: erucic free rapeseed oil is considered one of the best vegetable oils from the nutritional perspective (and is ideal for biodiesel production)



Milestones in rapeseed breeding: towards 0- and 00-quality /2

1978	First winter rape variety LEDOS in 00-quality
Since 1986	Total conversion of the german production with 00-variety CERES ff.
	<i>Threshold for glucosinolates: < 18 μmol GSL/g seed</i>

High value of the residual meal /cake after oil extraction:

Rapsextraktionsschrot (RES) as a high value protein ingredient in diets for ruminants, pigs and poultry



Breeding for Quality in Rapeseed

NIRS = Near – Infrared – Reflection - Spectroscopy

Estimation of:

- ✓ Glucosinolate content
- ✓ Oil content
- ✓ Fatty acid profile
- ✓ Protein content
- ✓ Fibre content



Rapeseed extraction meal (RES) compared to other protein feed sources

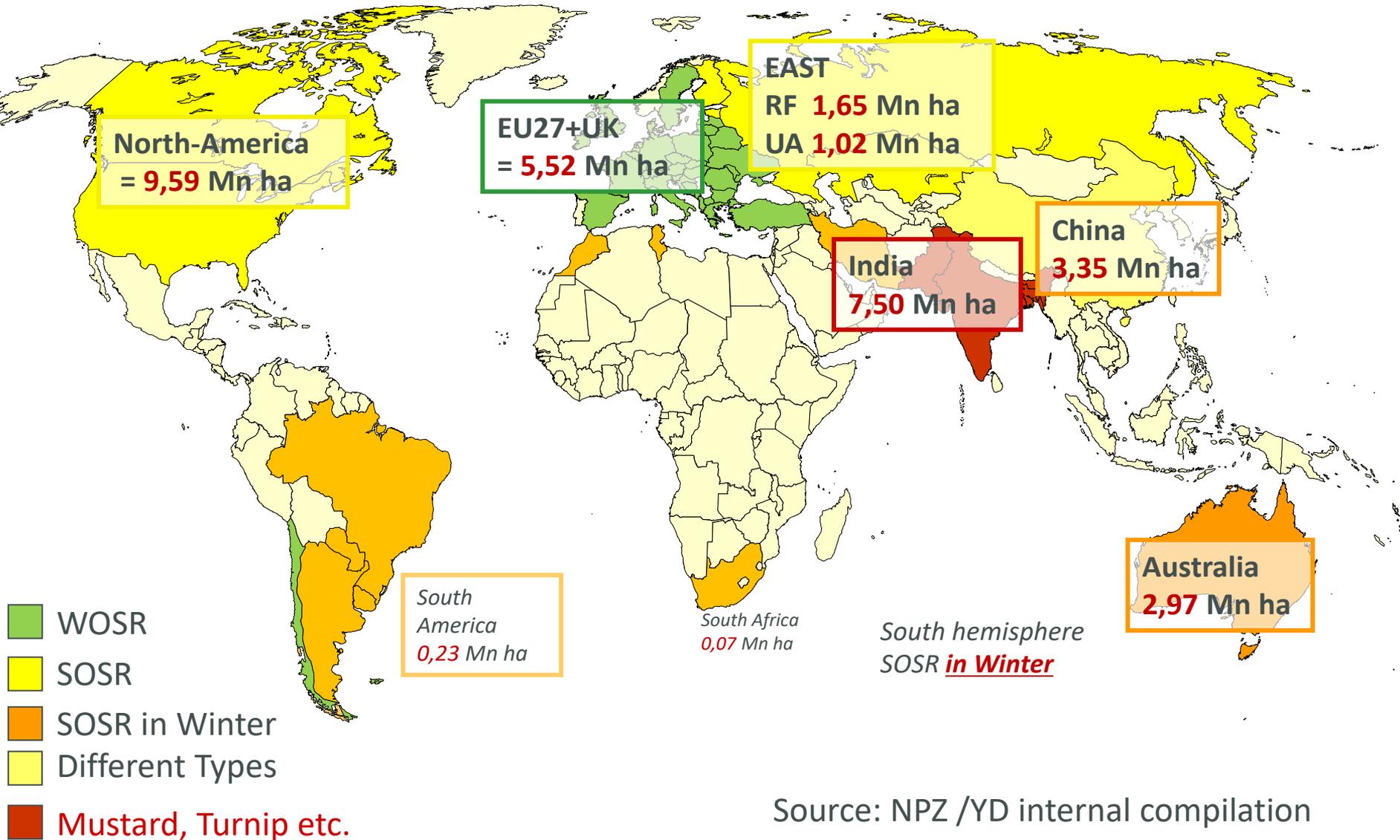
Feed	Crude fiber g/kg	Crude protein g/kg	UDP %	NEL	nXP	RNB	Phosphate
Peas	59	220	15	7,5	165	+9,0	2,8
Corn gluten feed	80	230	25	6,9	168	+9,8	8,1
Faba beans	78	262	15	7,6	172	+14,5	5,1
Wheat/Barley stillage dry	70	350	40	6,9	250	+16,0	8,4
<u>Rapeseed extraction meal</u>	118	339	35	6,4	227	+19,8	11,0
<u>Soybean extraction meal:</u>							
- rich in hulls	80	420	30	7,4	247	+27,7	6,5
- "Standard"	60	440	30	7,6	256	+29,4	6,2
- low in hull, high protein	40	480	30	7,7	270	+33,6	6,7

UDP: undegradable Protein
NEL: Net energy for Lactation
nXP: usable crude protein at the duodenum
RNB: ruminal N-balance

source: UFOP brochure

RAPSEED AREA GLOBAL F 2021/22 HARVESTED = 33,9 Mn ha

SOURCE: USDA / OIL WORLD / EUROSTATS – Jun21



The case of oilseed rape

A world wide success story: fuelled by breeding for food **and** feed

Necessary „Ingredients“

- long term strategy of all stakeholders involved: breeders, oil millers, animal nutritionists , farmers
- Detection of Mutants in the desired character in a world wide collection – plant breeding was the key !
- Effective methods to score large amounts of genetics for Fatty acids and Glucosinolates

Outlook: *Rapeseed protein is well suited for human consumption : - a future competition to the feed use?*

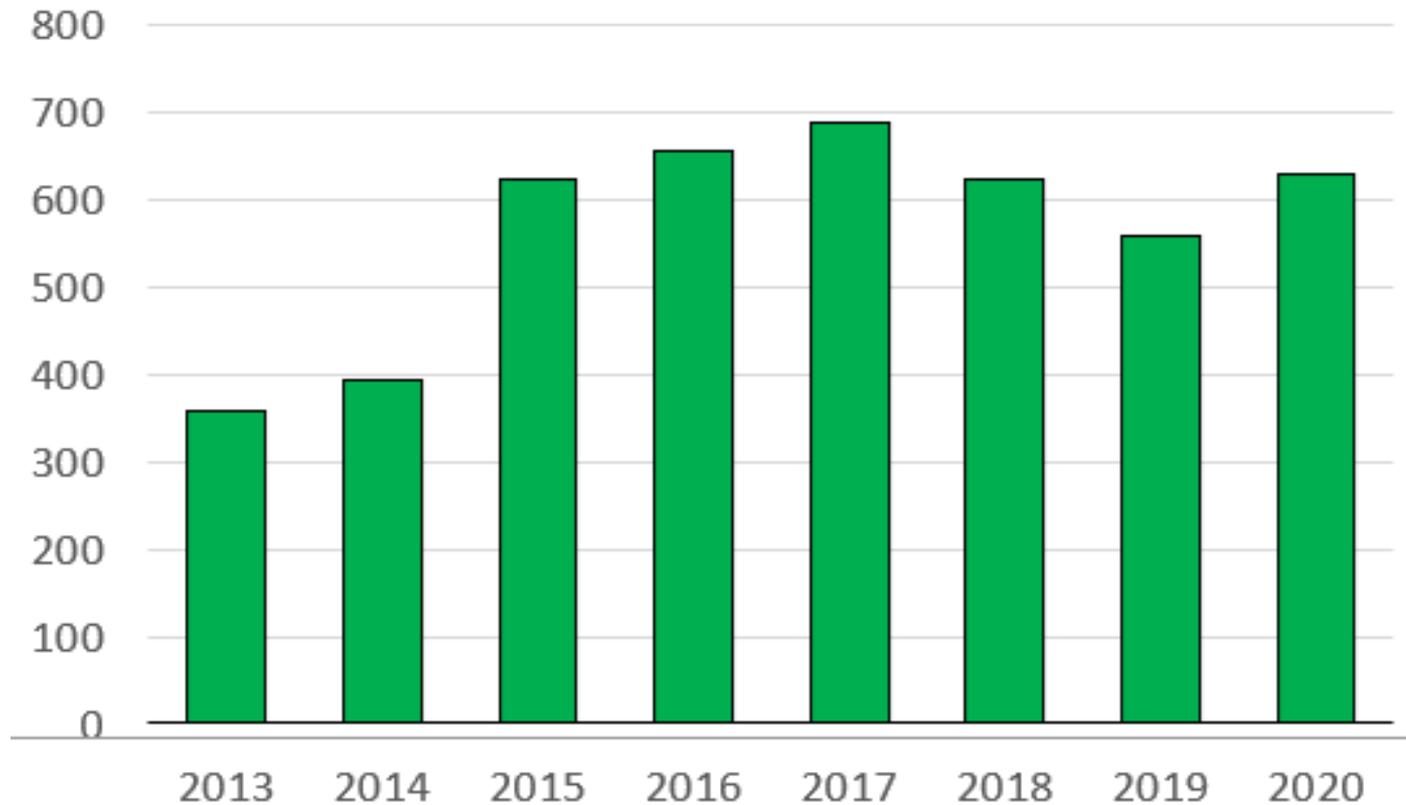
Combining Peas (dry), faba beans and lupins in the EU

The long (and discouraging) past

- Trend for their Cultivation was negative since end of 1980s (exception: faba bean in UK)
- The „critical mass“ of produce available became too low for foodstuff companies
- Home grown pulses were only paid low prices: mainly driven by cheap and abundant imports of soybeans and not reflecting the true feeding value
 - This was/is the main obstacle for any positive development
- Food market only marginally existing
- Breeding was more and more reduced, consequently progress in yield and agronomy was significantly slowed down

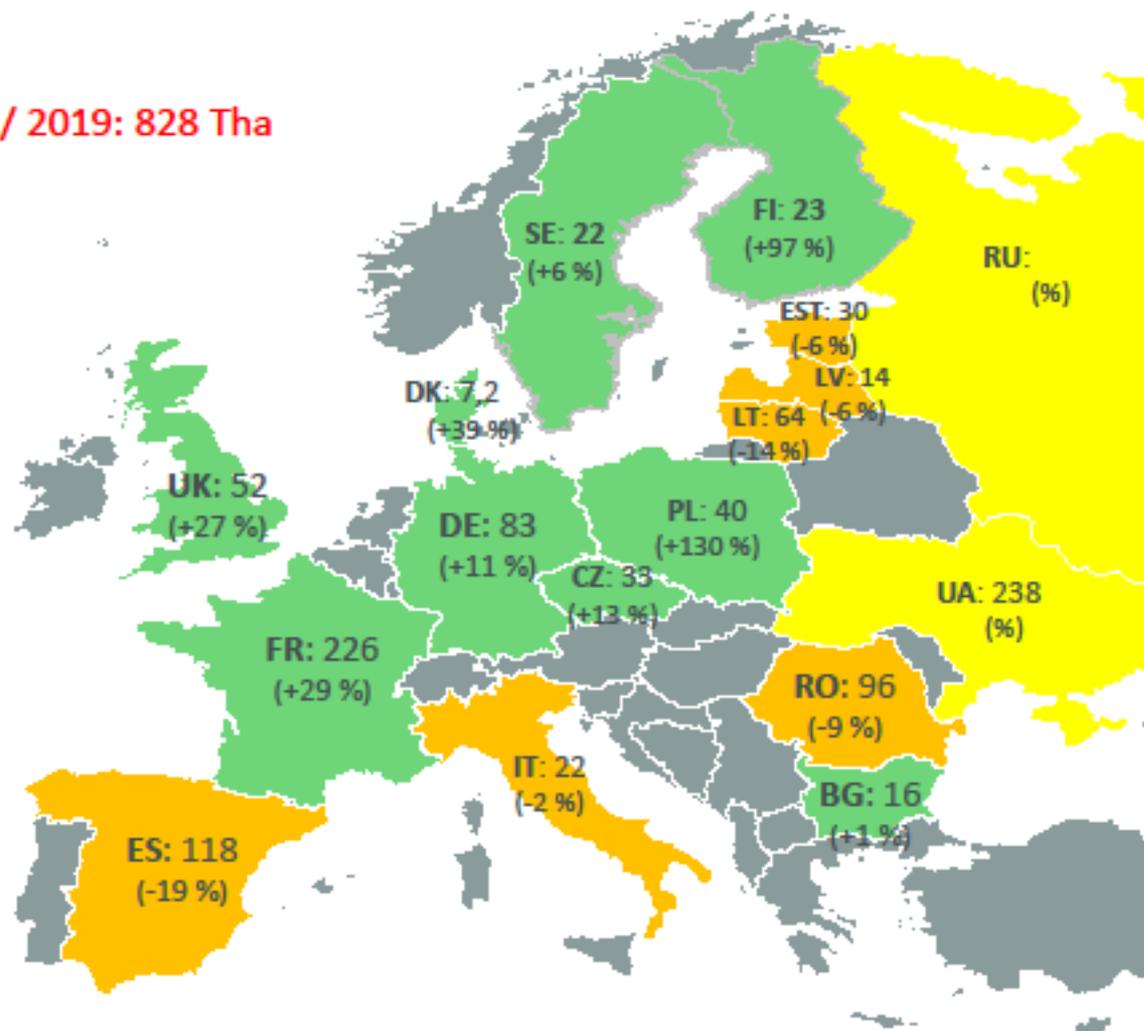
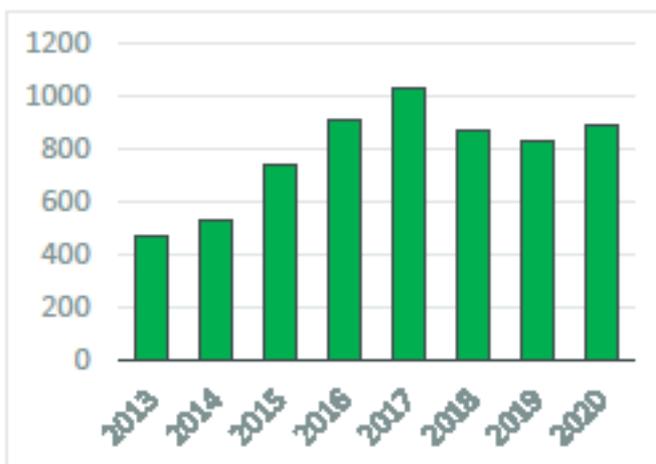
Evolution of faba bean acreages in the EU

source: EUROSTAT



Field Peas – Planting areas 2020 (in 1.000 ha)

EU 27 + UK: 893 Tha +8 % / 2019: 828 Tha



Source: Eurostat 2020

Breeding of peas, faba beans and lupins in the EU

The Trend - the (encouraging) future?

- European pulses recently became more interesting due to
 - Urgent need to extend crop rotations
 - Very low carbon dioxide footprint due to autonomy to synthetic N-fertilizer (N-fixing capability)
 - Ecological benefits: e.g. nourishing pollinating insects, enhancing diversity
- Trend to locally produced food and vegetarian/vegan food („plant meat“)
- Food market options evolve: increasing interest in protein from peas, faba beans and lupins as an alternative to soybean protein resulting in higher added value
- No longer only the cheap, undervalued and underpaid protein feed
- Positive trend fuelled new breeding activities

The case of european pulse

A success story still to unfold ?

- Added value seems to be mainly in the food sector
- **Competition for raw material will be in disfavour of the feed sector**
 - **As a consequence of limited production in EU the quantities will most likely move into the food sector**
- So far breeding goals for feed and food seem to be beneficial for both feed and food , no contrasting breeding goals yet
- Needs significant breeding inputs to stabilize and expand the acreages
- Soybeans are evolving as a serious pulse crop for many EU areas as well

Thank you for your attention

