Present Status and Future Prospects of Rapeseed-Mustard in India

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Indian Agriculture Industry

Growing Population

Expected to grow from 1.3 bn in 2021 to 1.9 bn by 2050

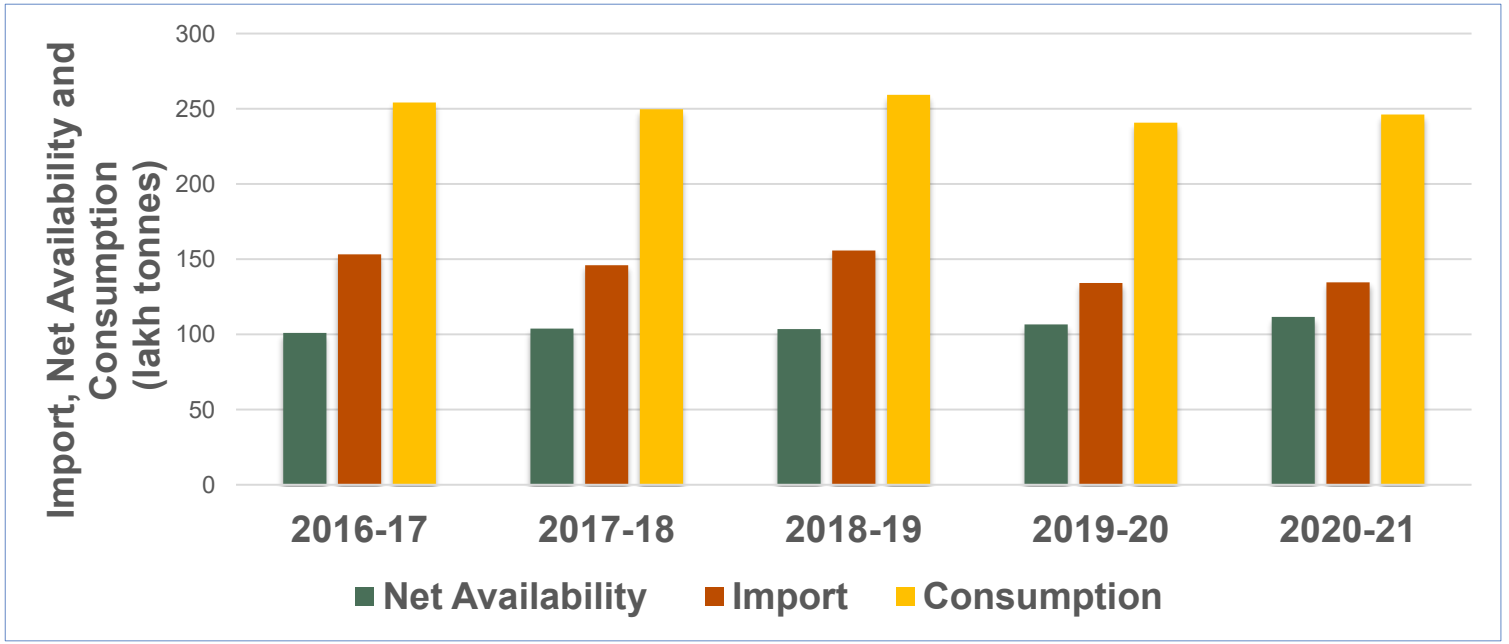
Reducing Arable Land due to Rapid Industrialisation

0.33 ha → 0.14 ha → 0.05 ha

1951 2001 2035

Use of Crops as Bio-Fuels

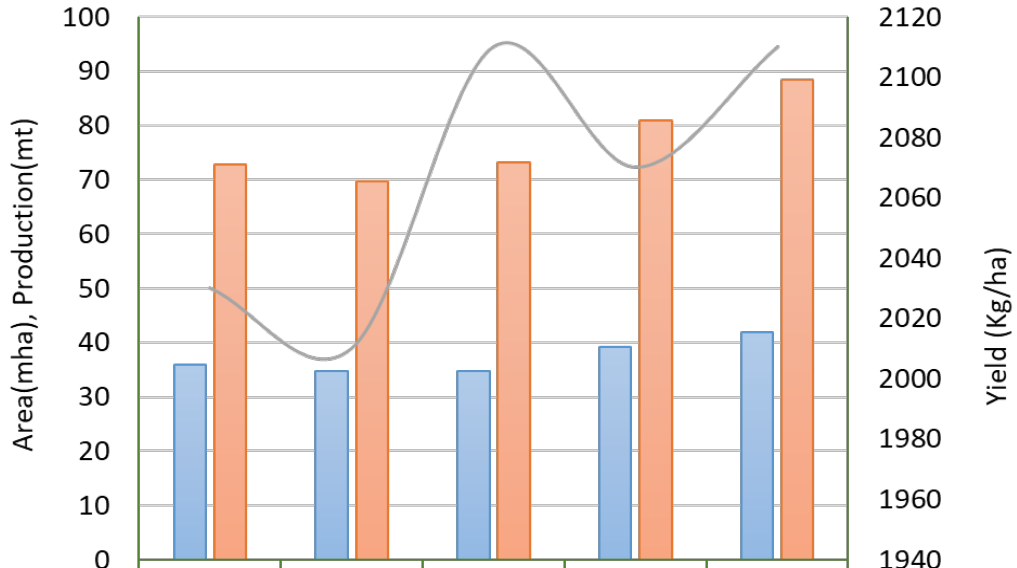
Net Availability, Import and Consumption (lakh tonnes)



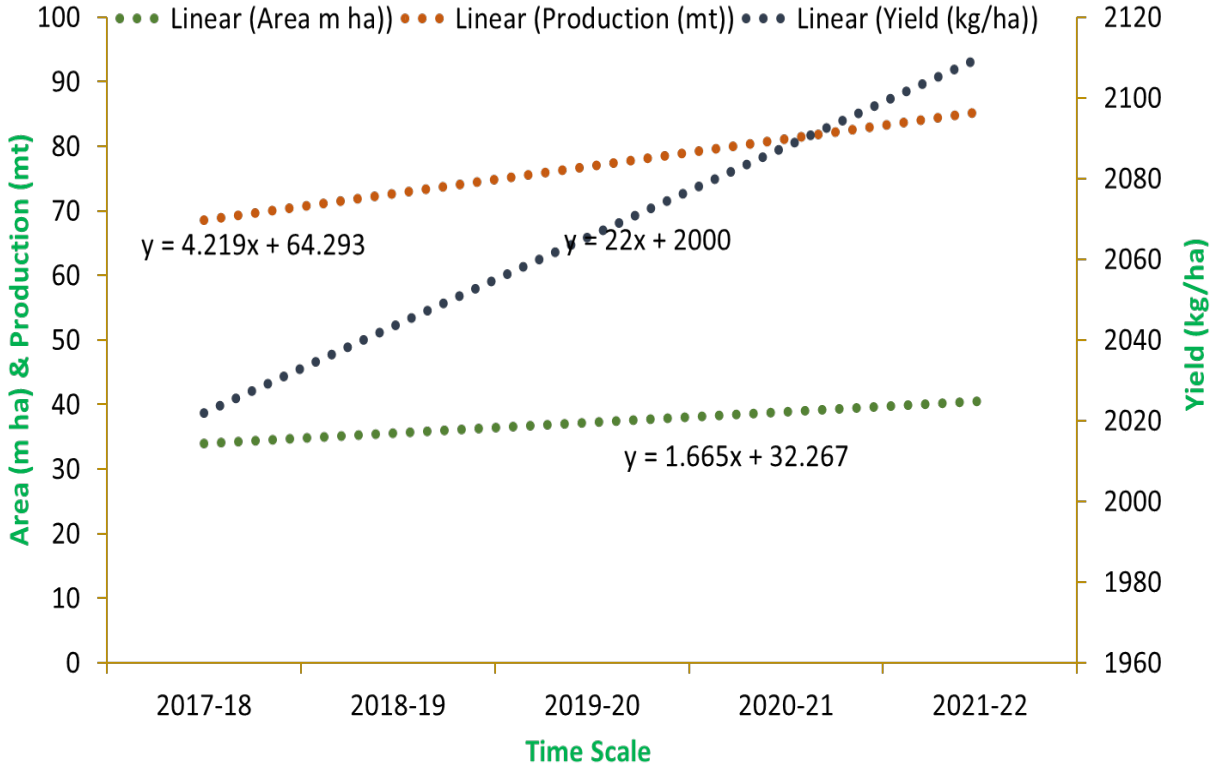
Why Rapeseed-mustard ???

- Adaptability to irrigated and rainfed areas
- Suitability for sole and mixed cropping
- Relatively salt tolerant
- Higher return with low cost of production
- Low water requirement
- About 35-46 % oil in the seed
- Saturated fatty acid lowest
- Seed meal has high quality protein content (36-38%).
- Most responsive crop for Phytoremediation
- Indian mustard is an most responsive to extract heavy metals

Current trends in rapeseed-mustard in the World

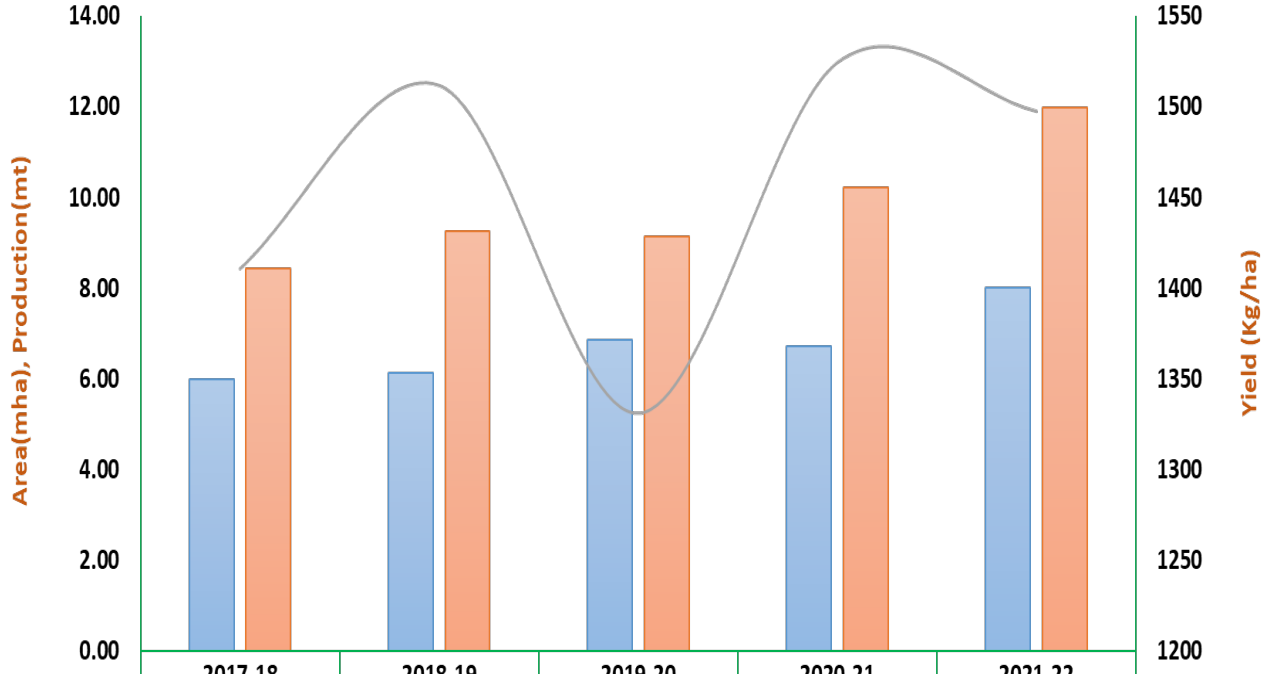


	2017-18	2018-19	2019-20	2020-21	2021-22
Area (Mha)	35.846	34.68	34.696	39.13	41.95
Production (Mt)	72.853	69.598	73.161	80.79	88.35
Productivity (kg/ha)	2030	2010	2110	2070	2110

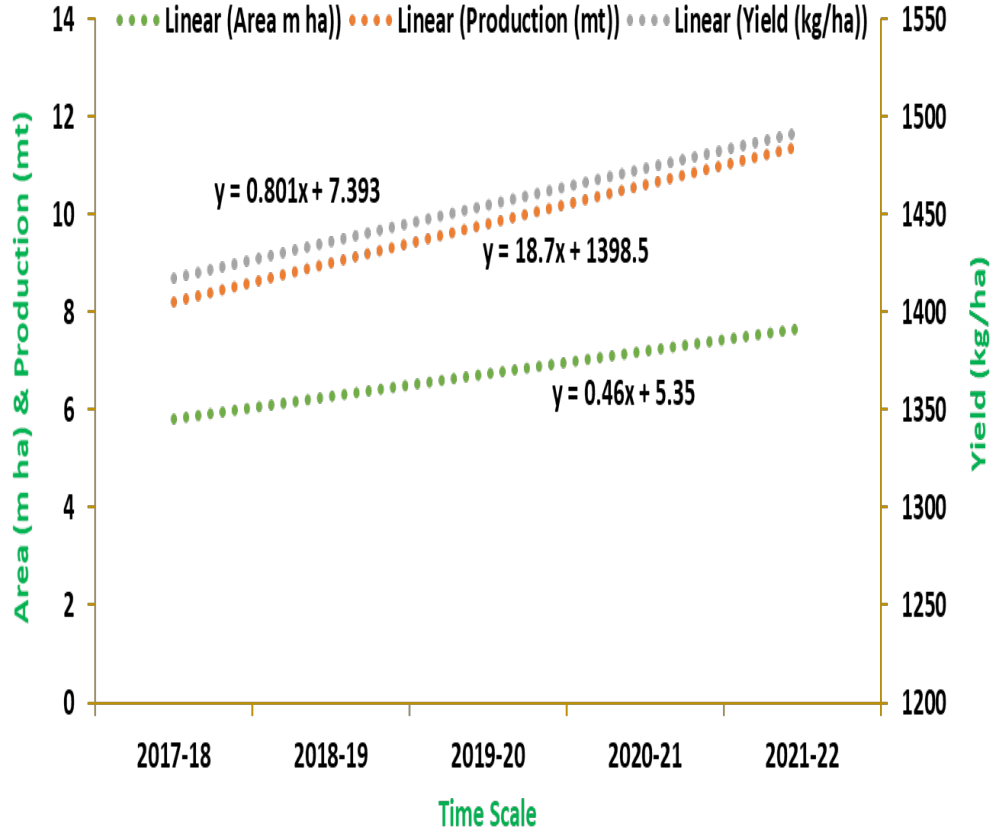


Gain in area- 17%; production- 21%; yield- 4%

Current trends in rapeseed-mustard production in India



	2017-18	2018-19	2019-20	2020-21	2021-22
Area (Mha)	5.98	6.12	6.86	6.70	7.99
Production (Mt)	8.43	9.26	9.12	10.21	11.96
Productivity (kg/ha)	1410	1511	1331	1524	1497



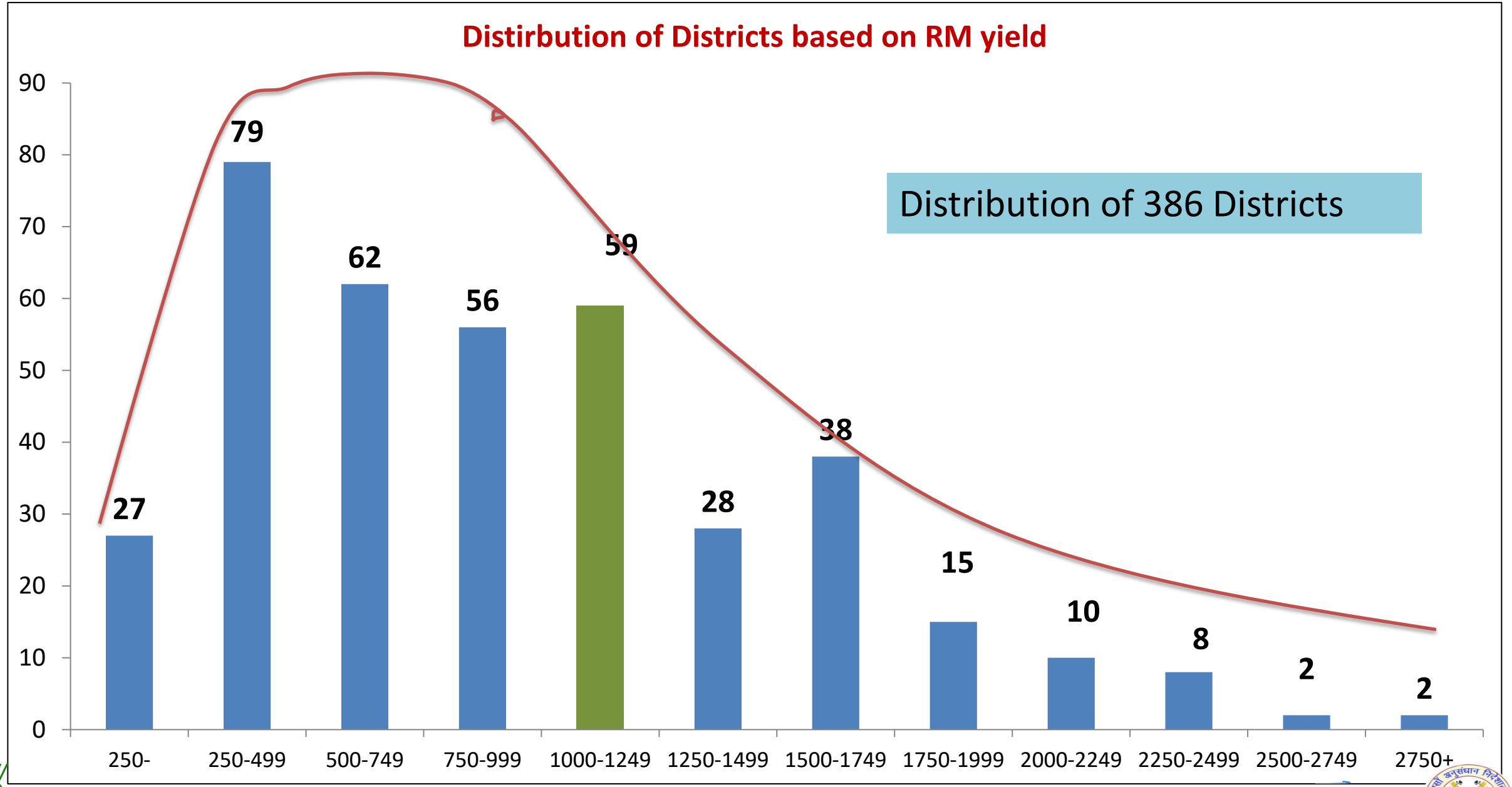
Gain in area- 33.6%; production- 41.9%; yield- 6.2%

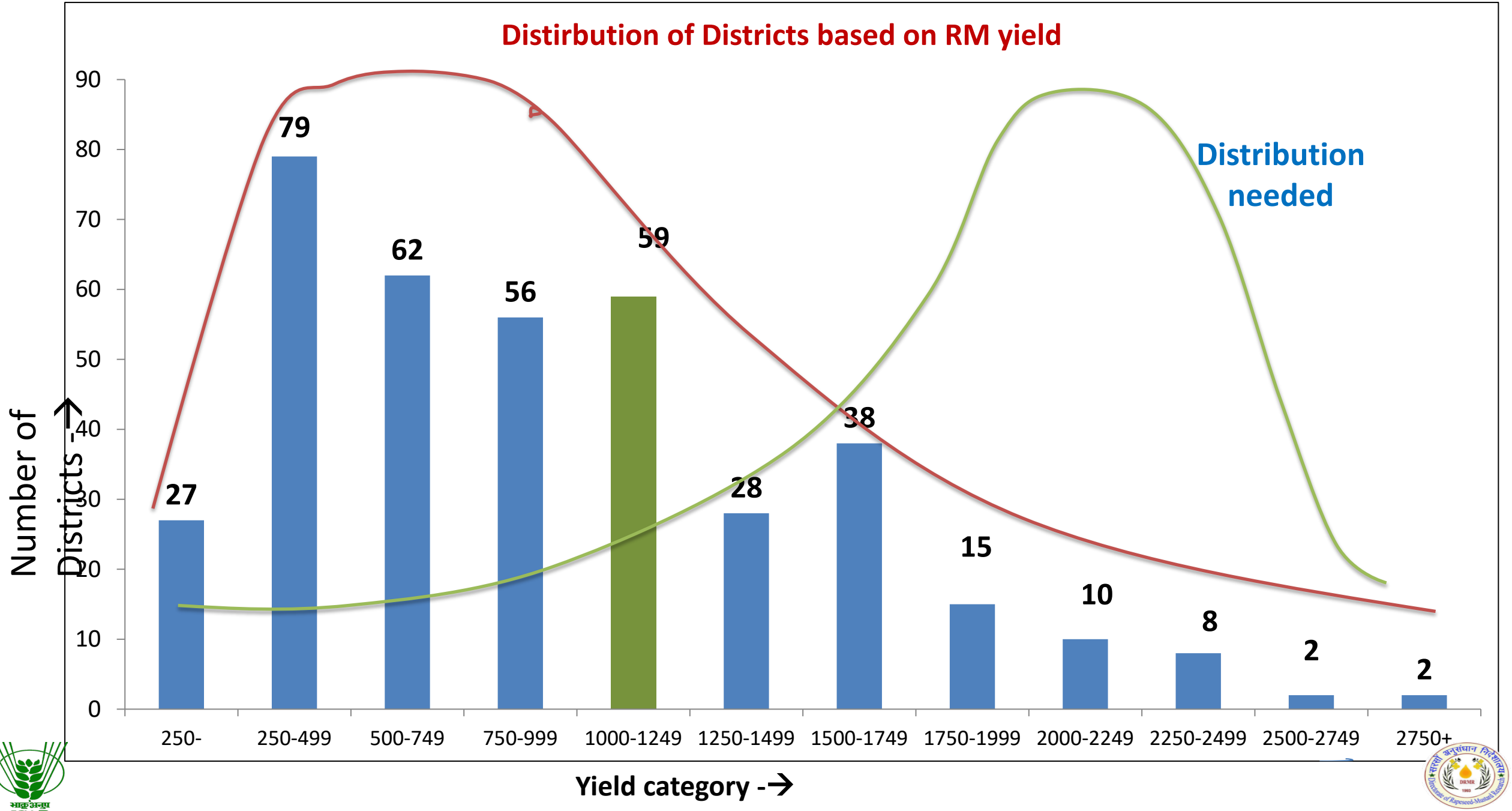
Yield ranged between 1.3 to 1.5 t/ha

Crop period, yield and per day productivity

Country	Crop duration (days)	Growing period (calendar months)	Photoperiod (hrs)	Yield (kg/ha)	Yield (kg/ha/day)	Yield (kg/ha/photoperiod hr)
France	330(90)	Aug/Sept-July	1450	3422	10.4	2.1
Germany	330(90)	Aug/Sept-July	1416	3947	11.9	2.8
Australia	150(41)	May/June-Nov/Dec	1315	1266	8.4	1
Poland	330(90)	Aug/Sept-July	1357	2908	8.8	2.1
Canada	120(33)	May-Aug/Sept	1206	2160	18.0	1.8
China	220(60)	Sept/Oct-May	1744	1978	9.0	1.1
India	120(33)*A	Sept/Oct-April	780	1524	12.7	1.9

Values in parenthesis are the % time of a year (365 days).
*Growing period for *B. juncea*, rest are *B. napus* A = Denotes average crop period of Rapeseed -Mustard

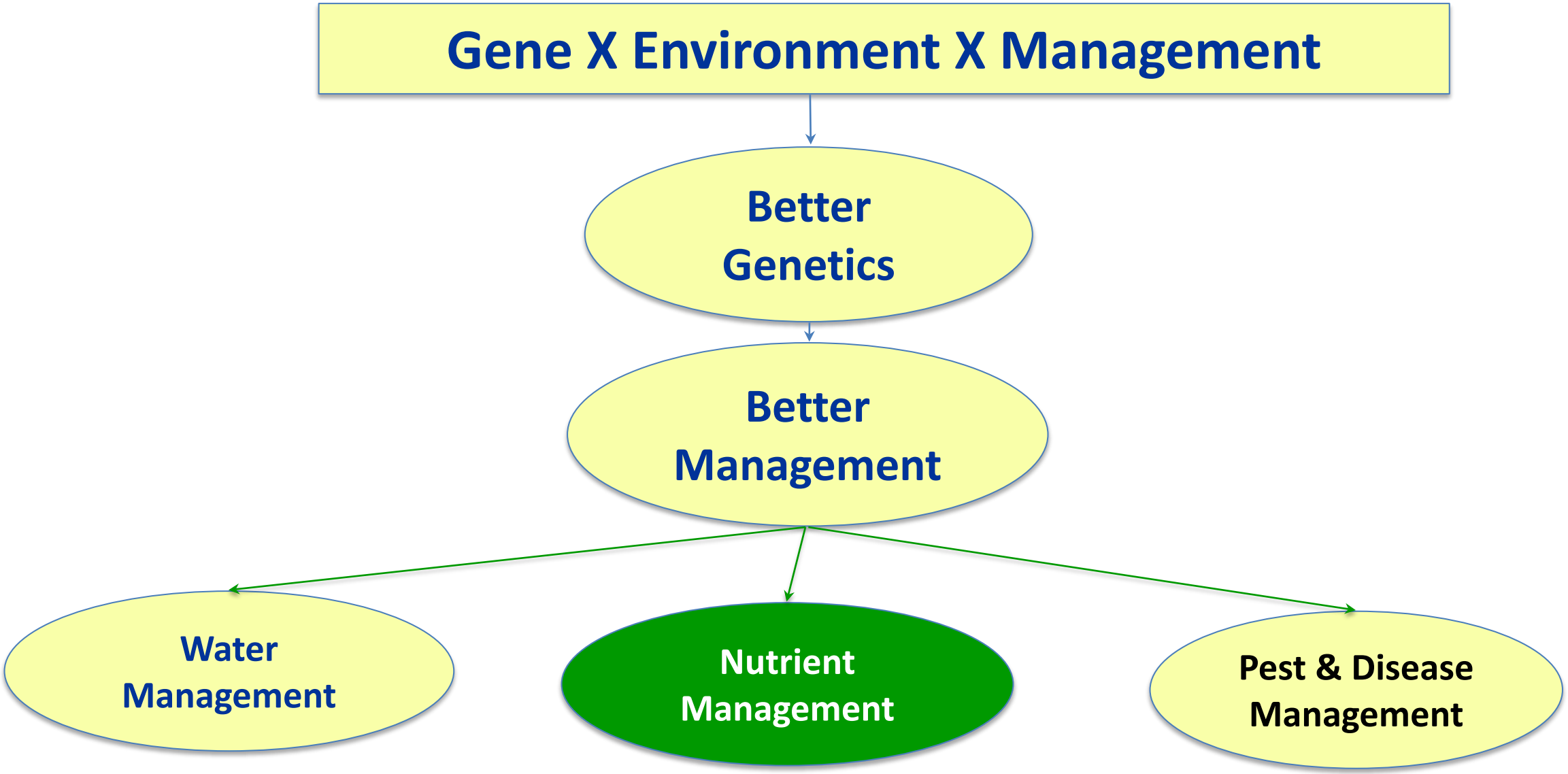

Distirbution of Districts based on RM yield
Distribution of 386 Districts
Number of Districts -→
Yield category -→
0
10
20
30
40
50
60
70
80
90
27
79
62
56
59
28
38
15
10
8
2
2
250-
250-499
500-749
750-999
1000-1249
1250-1499
1500-1749
1750-1999
2000-2249
2250-2499
2500-2749
2750+


Distirbution of Districts based on RM yield
Distribution needed
Number of Districts -→
Yield category -→
0
10
20
30
40
50
60
70
80
90
27
79
62
56
59
28
38
15
10
8
2
2
250-
250-499
500-749
750-999
1000-1249
1250-1499
1500-1749
1750-1999
2000-2249
2250-2499
2500-2749
2750+

Constraints in Mustard Production

- Complex existing and emerging disease and pest scenario
- Soil deficiency for nutrients and built-up of soil borne pathogens and abiotic stresses
- Large cultivation under resource constrained conditions
- Climate change (high temperature) Uncertainty of acreage due to climatic, biological, natural resources, policy decisions (MSP)
- Erratic rainfall in September
- Poor quality of ground water in major growing tracts
- Insufficient networking among various stakeholders and multiplicities in technology dissemination
- Real term stagnation in support price in comparison to competing wheat crop.

Improving Crop Productivity

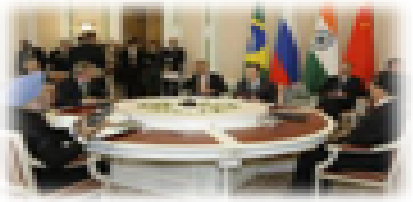


Strategy

Horizontal Expansion

Enhanced Genetic potential

Realizing the untapped potential of the existing technologies



Policy back up

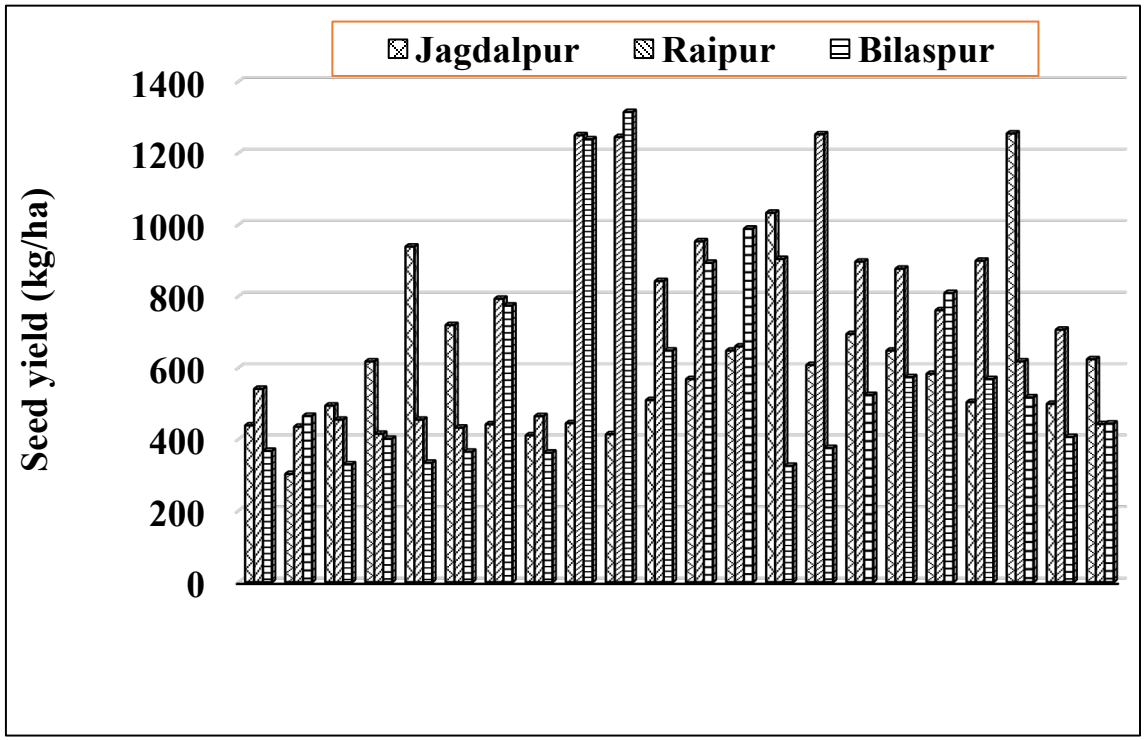
Sustainable crop resource management

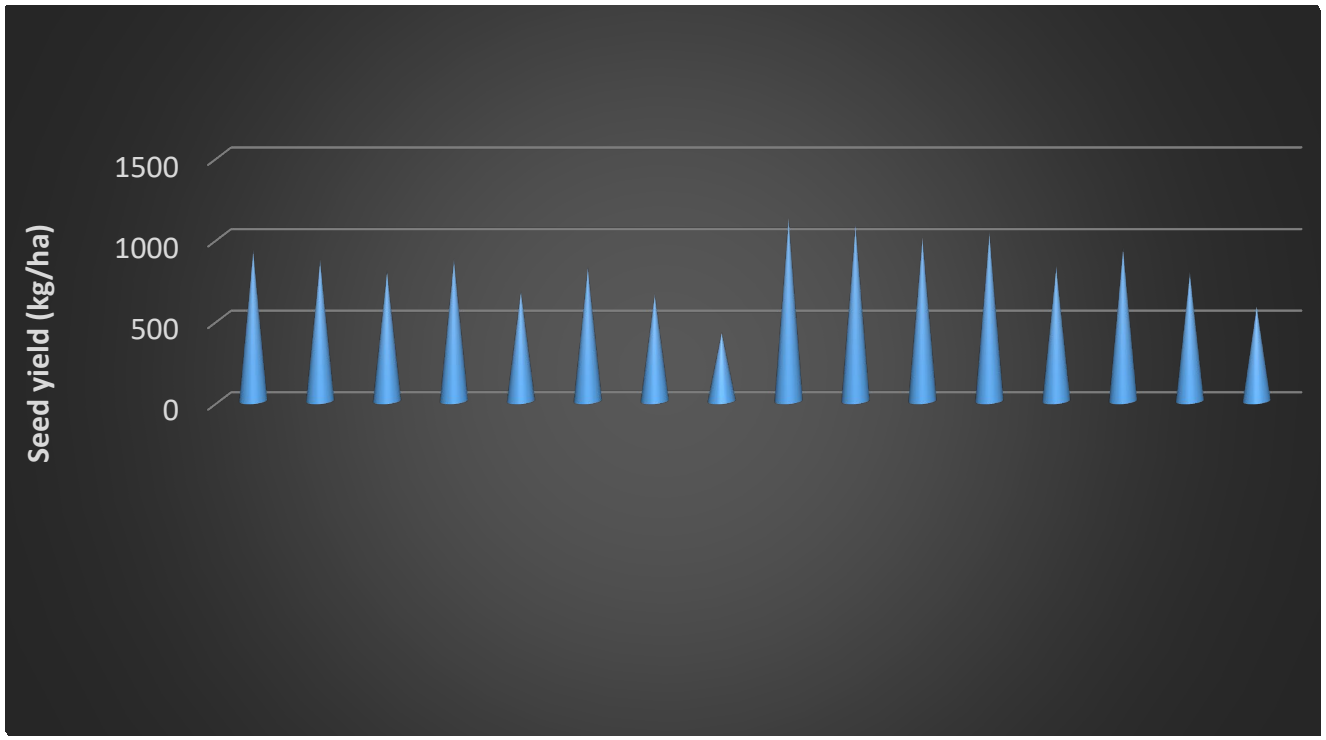
Mustard Scope in Non-Traditional areas of South India

Variety	Seed Yield (kg/ha)
Giriraj	1871
NRCDR-2	2035
NRCDR 601	2316
NRCHB 101	2854

Spacing : 45 X 10 cm
Date of Sowing : 3/11/2014
Plot Size : 213.75 Sq. meter

Technology for rice-fallow areas- varieties & crop establishment





V1-PM 25, V2-NRCHB 101, V3-RH 406, V4-DRMRIJ 31, V5-Pusa Mahak, V6-Bhawani, V7-DRMR 150-35, V8-PT 303, V9-YSH 401, V10-Pitambari and V11-CG Sarson (local)

Jat et al. 2019

Transplanting for small land holdings

Transplanting of mustard has also been reported to save time, resources, reduces days to maturity and results in higher seed yield

Transplanting time and planting geometry

Treatments	Yield (q/ha)			Harvest Index (%)			NMR (Rs.)	B:C ratio
	2016-17	2017-18	Mean	2016-17	2017-18	Mean		
Planting geometry								
30x30 cm	35.54	33.56	34.55	30.2	29.9	30.05	86,705	3.32
45x30 cm	39.34	36.04	37.69	30.8	30.6	30.70	1,00,835	3.77
60x30 cm	31.51	31.59	31.55	29.6	29.1	29.35	75,065	3.11
CD (p=0.05)	1.45	1.18	-	1.02	1.21	-	-	-
Date of transplanting								
13 Oct	40.38	37.22	38.8	30.7	30.4	30.55	1,04,920	3.96
22 Oct	36.37	35.27	35.82	30.5	29.82	30.16	93,510	3.63
1 Nov	29.41	29.29	29.35	29.29	29.42	29.36	66,875	2.88
CD (p=0.05)	0.49	0.11	-	0.34	0.59	-	-	-

Crop yields, system productivity and economics of CA-based Indian mustard systems

Treatments	Mustard seed yield (t/ha)	Rainy crops yield (t/ha)	System grain yield (t/ha)	Mustard equivalent yield (t/ha)
Tillage practices:				
PB+R	3.0^{a}	1.4^{a}	4.3^{a}	3.9^{a}
ZT+R	2.8^{ab}	1.2^{b}	4.0^{b}	3.5^{b}
CT-R	2.6^{b}	1.2^{b}	3.9^{b}	3.5^{b}
Cropping systems:				
F-M	2.8^{c}	0	2.8^{e}	2.8^{e}
CB-M	2.9^{b}	1.0^{c}	3.9^{b}	3.9^{c}
GG-M	2.9^{b}	0.8^{d}	3.8^{c}	4.2^{b}
Mz-M	3.1^{a}	3.7^{a}	6.8^{a}	4.5^{a}
PM-M	2.6^{d}	1.5^{b}	4.1^{b}	3.2^{d}
S-M	2.4^{e}	0.6^{e}	3.0^{d}	3.2^{d}

F-M: Mustard; CB-M: Cluster bean & Mustard; GG-M: Green gram & Mustard; Mz-M: Maize & Mustard; PM-M: Pearl millet & Mustard; S-M: Sesamum & Mustard

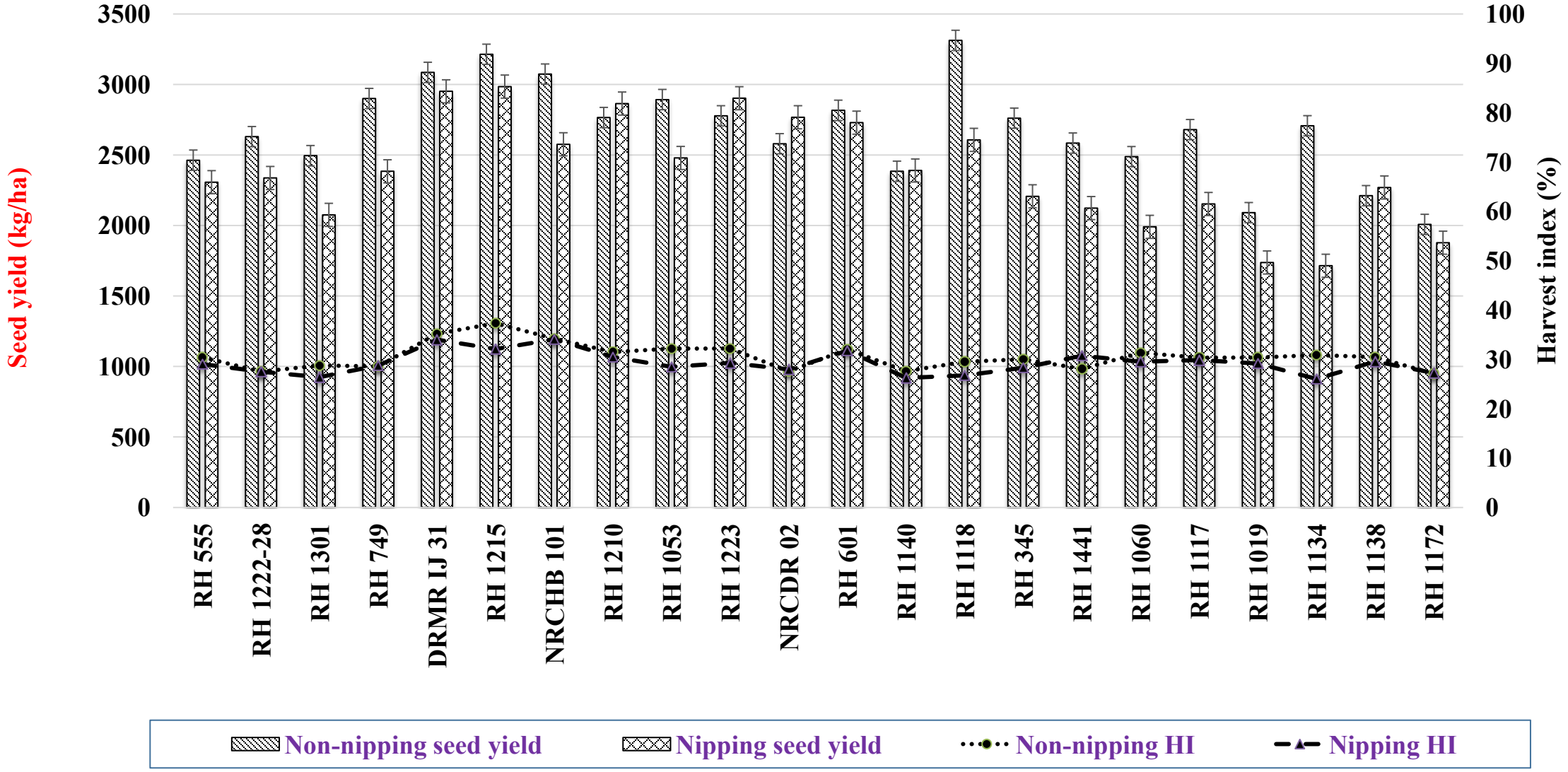
PB+R: Permanent beds with crop residue; ZT+R: Zero tillage with crop residue; CT-R: Conventional tillage without residue

Jat et al, 2021

Raised bed planting

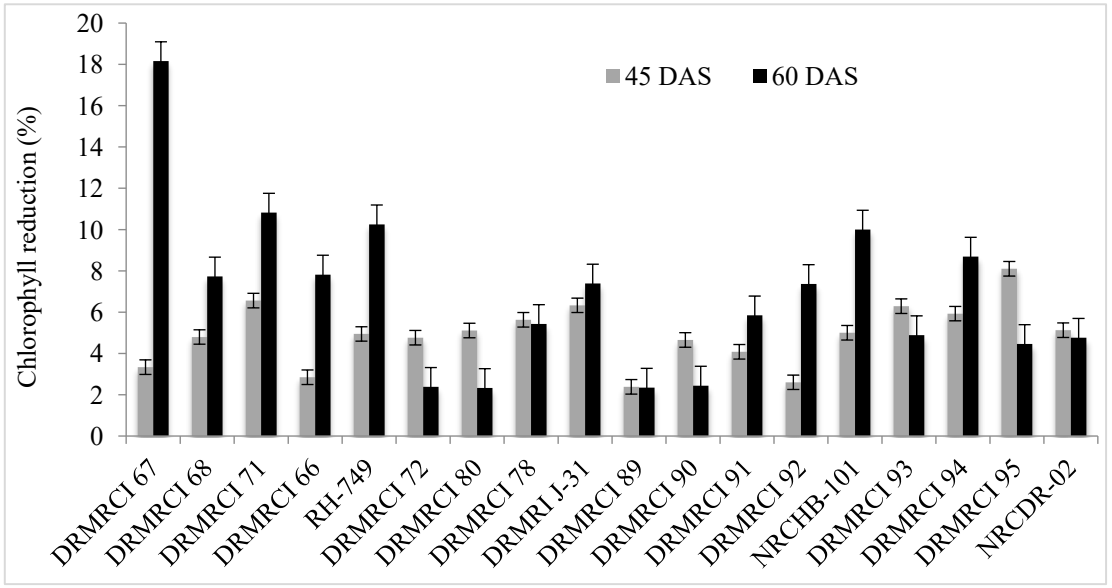
Saving of time, irrigation water and improve yield and soil health

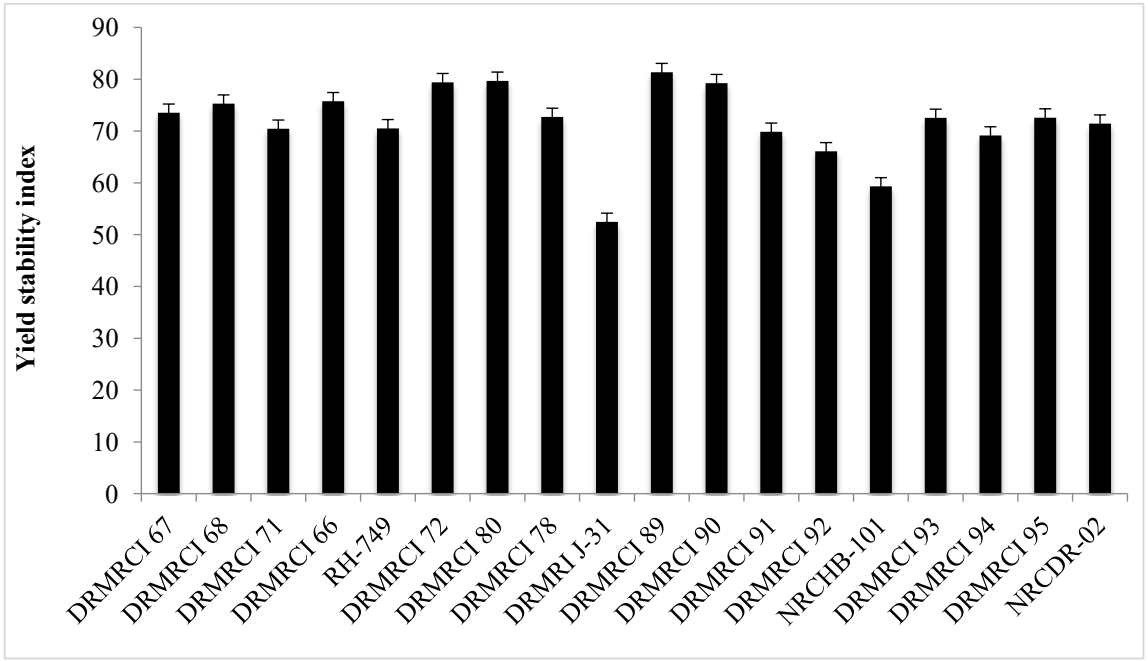
Nipping in mustard to divert the photosynthates



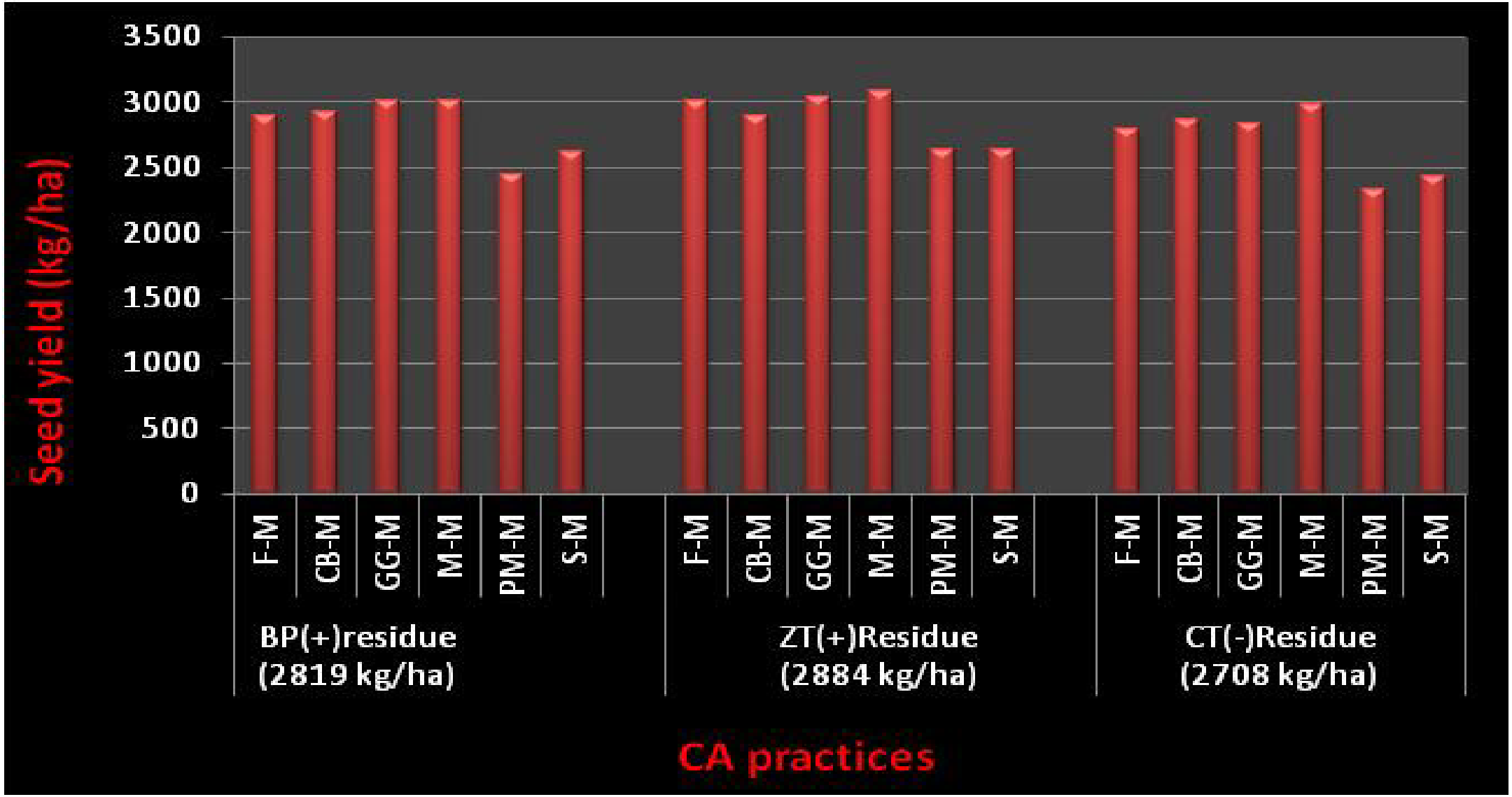
Jat et al. 2020

Varieties screening for drought tolerance





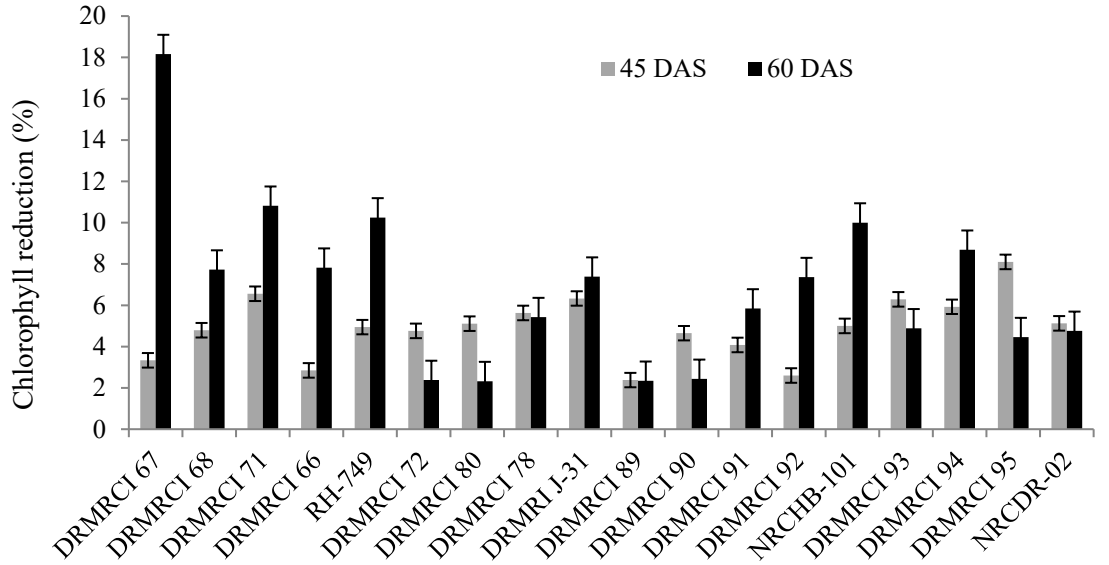
Mustard seed yield under CA practices (3 yrs mean)

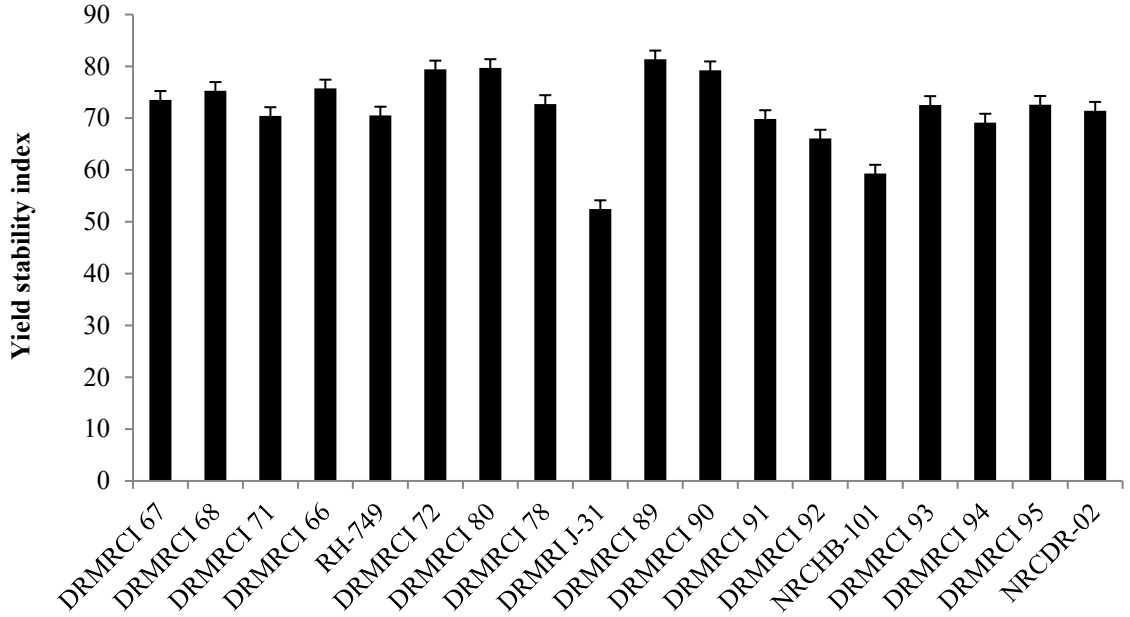


Yield, productivity and economics under CA

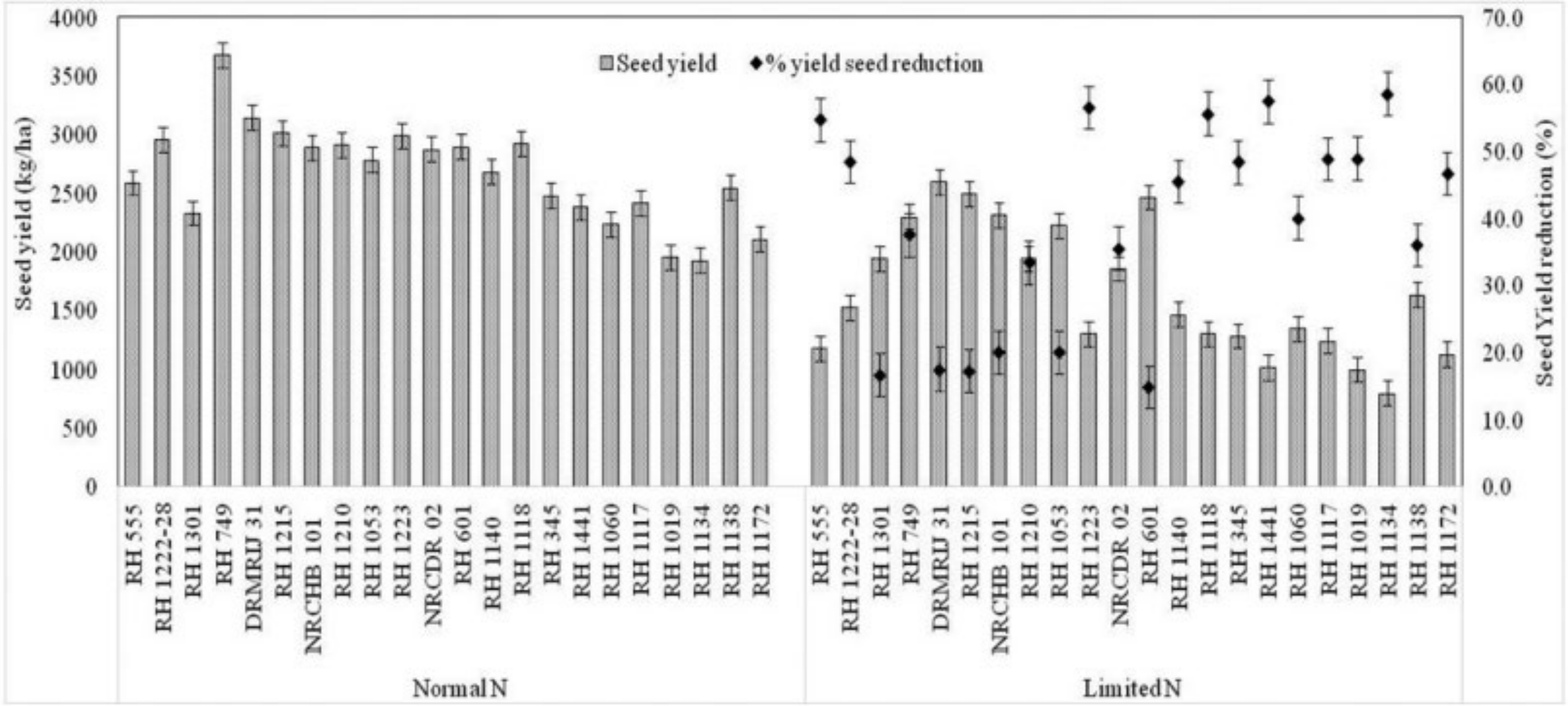
Treatments	Mustard seed yield (t/ha)	Kharif crops seed yield (t/ha)	Total system yield (grains t/ha)	System equivalent yield (t/ha)	Net return (USD/ha)	REE (%)
Tillage practice						
Permanent raised beds (+R)	3.0^{a}	1.4^{a}	4.3^{a}	3.9^{a}	1720^{a}	20.3
Zero tillage (+R)	2.8^{ab}	1.2^{b}	4.0^{b}	3.5^{b}	1518^{b}	6.2
Conventional tillage (-R)	2.6^{b}	1.2^{b}	3.9^{b}	3.5^{b}	1430^{b}	-
Cropping system						
Fallow-mustard	2.8^{c}	0	2.8^{e}	2.8^{e}	1291^{d}	-
Cluster bean-mustard	2.9^{b}	1.0^{c}	3.9^{b}	3.9^{c}	1777^{c}	37.7
Green gram-mustard	2.9^{b}	0.8^{d}	3.8^{c}	4.2^{b}	1854^{b}	43.7
Maize-mustard	3.1^{a}	3.7^{a}	6.8^{a}	4.5^{a}	1982^{a}	53.6
Pearl millet-mustard	2.6^{d}	1.5^{b}	4.1^{b}	3.2^{d}	1247de	-3.4
Sesame-mustard	2.4^{e}	0.6^{e}	3.0^{d}	3.2^{d}	1185^{e}	-8.2

Varieties screening for drought tolerance





Screening for N efficient genotypes/varieties



Seed yield and per cent seed yield reduction in genotypes of Indian mustard under contrasting N supply.

Jat et al. 2022

Low cost Input Technologies

- Selection of appropriate cultivars for specific agro-ecological situation and use of certified seed
- Specific adaptation to stresses
- Cropping Systems
- Optimum seed rate and spacing
- Optimum time of seeding
- seeding techniques
- Need based judicious use of fertilizer
- Recycling of organic waste
- Use of organic manures
- Direction of sowing
- Detopping
- Timely weeding
- Supply of irrigation water and improved method of its application

Thanks

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