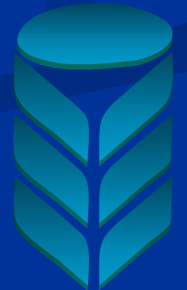


Sunflower Plant Breeding – International Perspective

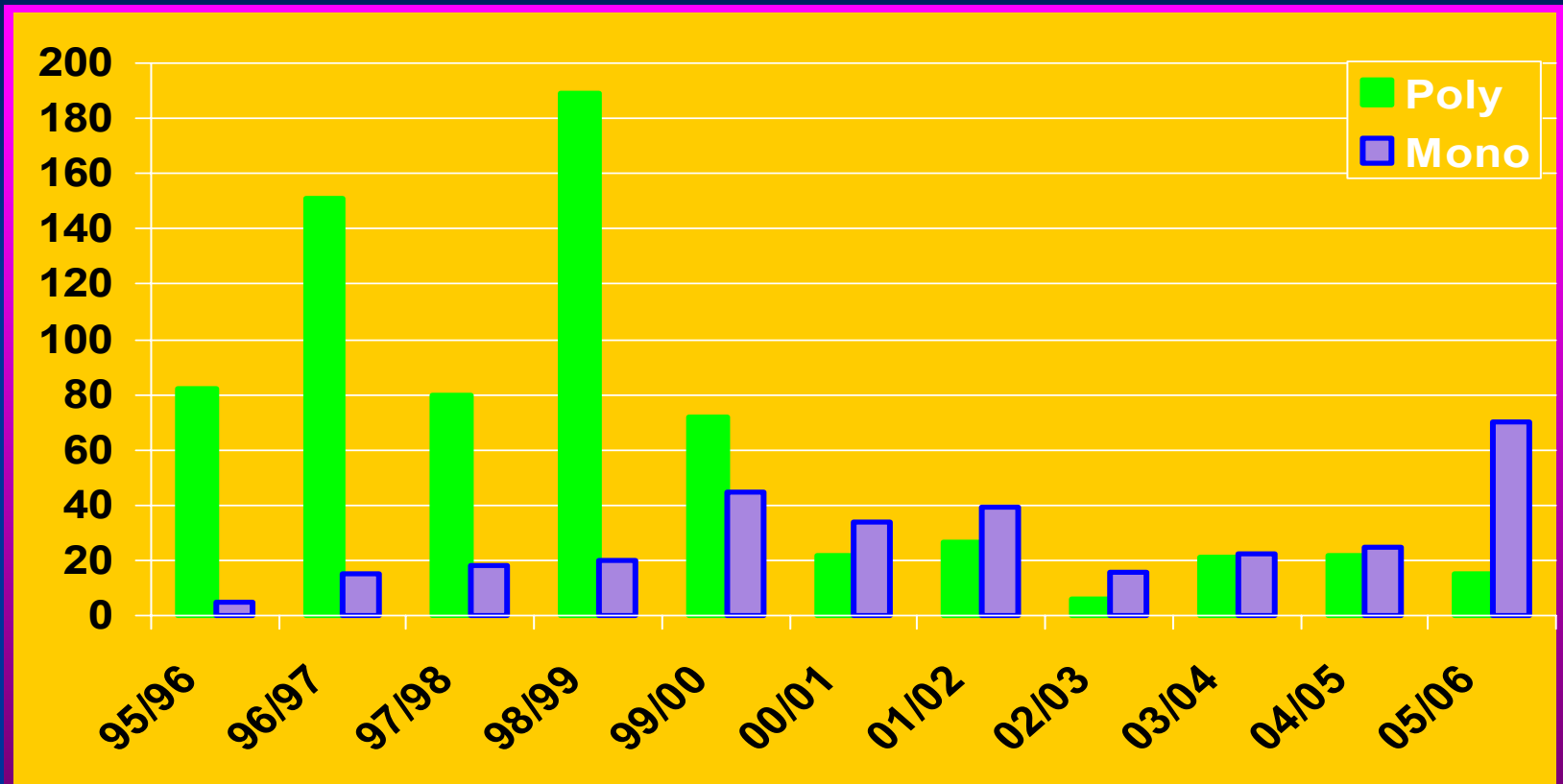


Australia – Breeding Background

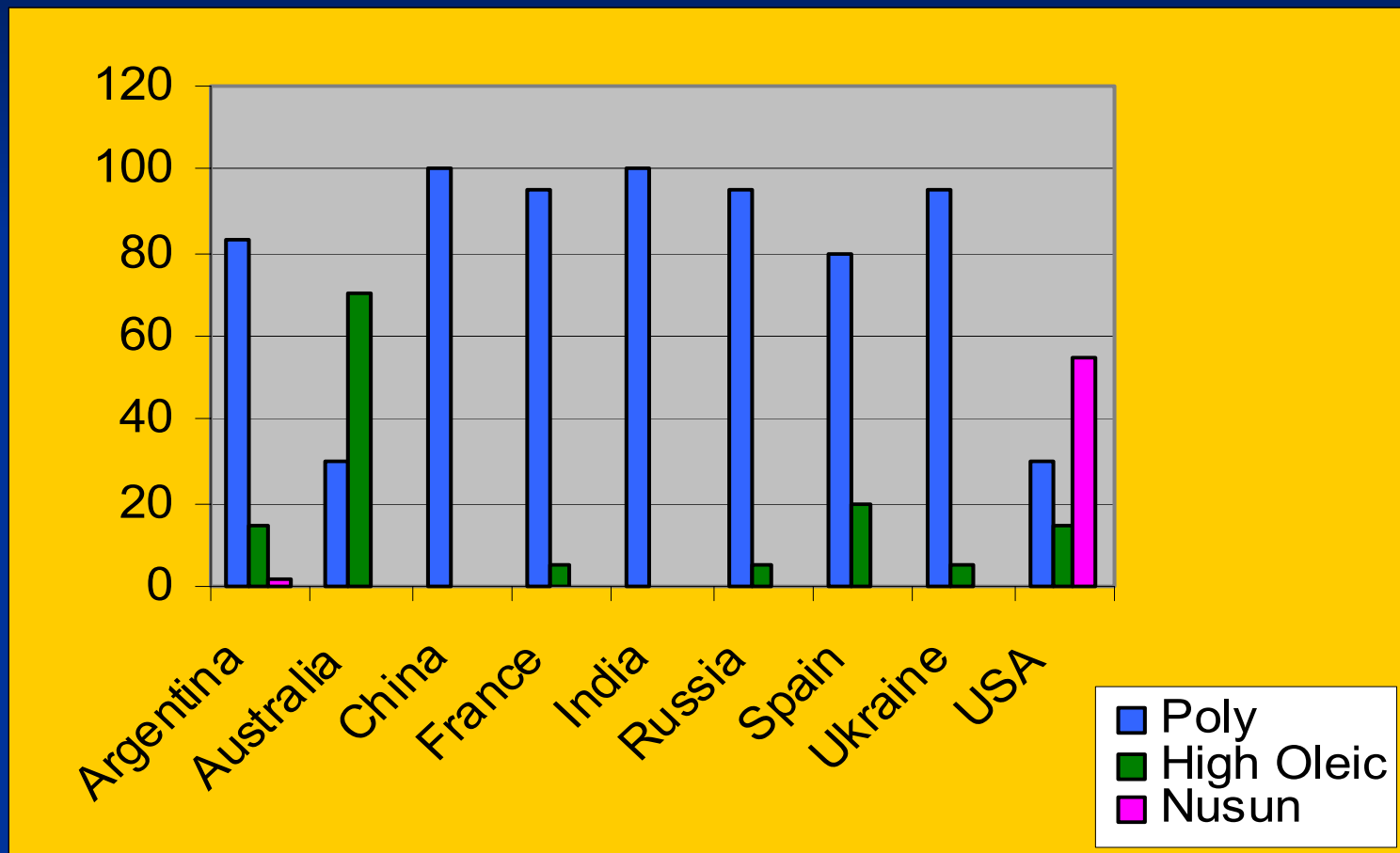
- 1972 - Hybrid system developed (France and USA)
- 1974 – First hybrid variety released in Australia by PacSeeds – 2nd in the world
- Breeding activity started in 1974
- First Birdseed hybrid released in 1979
- First confection hybrid released in 1983
- High Oleic product released in 1990
- Australian product remained competitive ever since



Australian Sunflower Production (x1000 mt)



Sunflower Oil Production profiles



Objectives - Major



Objectives	Strategy
Yield	Testing
Oil	Breeding
Oil quality	Breeding
Rust	Gene pyramiding. Screening is in field with follow up race by race screen at Advanced level testing.
Sclerotinia	International screening
Downy Mildew	International screening plus molecular markers
Alternaria	International screening
Verticillium	International screening plus molecular markers
Self Compatibility	Paper bag screening at every selection cycle.
IMI and SU	Backcrossing – need BASF support
Moisture Stress	Collaboration with UQ on delta discrimination - so far no real result.



Sunflower Breeders

Domestic Suppliers	International
Pacific Seeds	Advanta – Australia, Argentina and India
Hylan	Monsanto – Argentina, France and Eastern Europe
Lefroy	Pioneer – USA and Europe
	Syngenta – Europe
	LimaGrain – Europe and USA
	Public - USDA

Summary – Major Private Company Sunflower Research

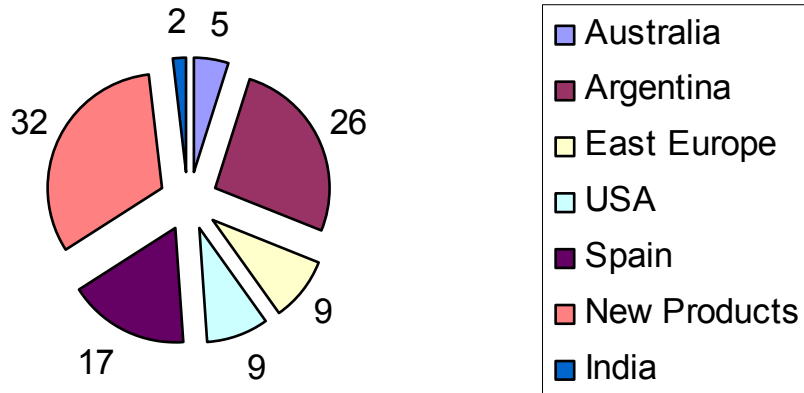
Technology.	Pacific Seeds/ Advanta	LimaGrain	Syngenta	Pioneer	Dow	Monsanto
Traditional Breeding - number of programs	3	5	3	4	3	4
Molecular Markers	Lab in Argentina	Associate companies	Lab in France.	Lab in USA	Lab in Indianapolis	Labs in USA
Transformation Capability	Yes - OXOX	Yes – through Biogemma in France	Yes – Lab in USA	Yes – in USA – OXOX and Modified oils	Yes – Bt genes	Yes- Labs in St.Louis – Roundup Ready

Global R&D Dynamics

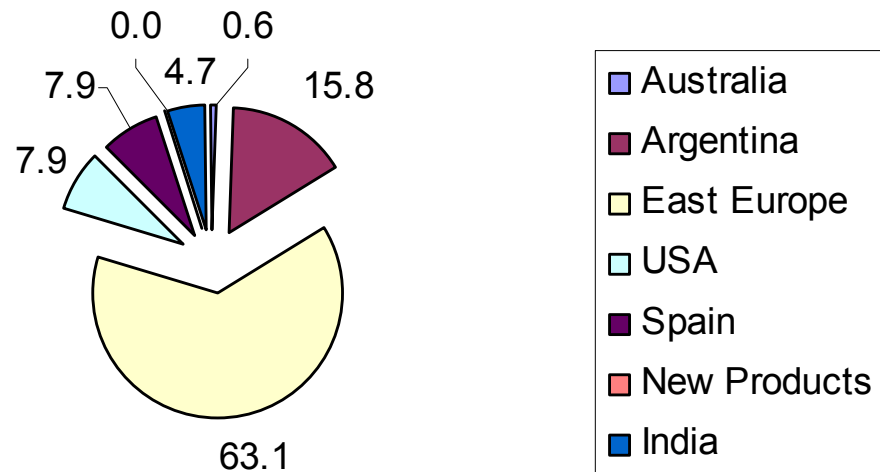


Market	% R&D spend - Advanta	HA grown	% of total crop
Australia	5	80	0.6
Argentina	26	2200	15.8
East Europe	9	8000	63.1
USA	9	1000	7.9
Spain	17	1000	7.9
New Products	32	0	0.0
India	2	600	4.7
	100	12680	100.0

% R&D spend - Advanta



% of total crop



Country comparisons

	# Programs	Area	HA/Program
Argentina	9	2200000	250,000
Australia	3	80000	27,000
Spain	3	1000000	333,000
France	8	600000	75,000
USA	7	1000000	145,000
Eastern Europe	10	8000000	800,000
India	5	600000	120,000
China	1	1000000	1,000,000

Trait Strategy - GMO



- No GMO traits near commercialization – GMO'S exist for Bt, RR, Mod Oils, OXOX, IMI and Liberty
- No commercial intent.

Trait strategy – non GMO



- Rust – breeders work independently and with the QDPI to develop resistance gene stacks.
- IMI – go slow.
- SU – dependent on Dupont – US reality – not sure about Australia.
- Mono market – developing with premiums intact. Increase emphasis in International markets.
- HSHO – targeting specific markets.

R&D Collaborations



- QDPI&F – rust pyramiding.
- UQ – Moisture stress screening – Delta project.
- University of Buenos Aires – moisture stress screening.
- Advanta – Argentina and India – germplasm exchanges.
- USDA and others – germplasm and trait access

Other Technology needs



Sunflower Double Haploids



SWOT



Strengths	Weakness'	Opportunities	Threats
Germplasm	Critical Mass	Herbicide resistance	Imports
Strategically located breeding programs	Limited grain buyers	New fatty acid portfolios	Disease
Multi generation breeding program through-put.	Meal quality	Improved moisture stress tolerance mechanisms	Loss of crushing capacity
	Production region with no proximity to population	Confectionary and multi-purpose varieties.	Lack of refiner participation in industry in the farm and pre-farm activities.
		Seed treatments	Other crops more competitive

Private Breeding Scorecard



* identify the traits (morphological, physiological...) that contributes to adaptation and productivity - 8/9

* find new genes encoding for desirable traits - 7/9

* combine genes for desired traits to improve cultivars - 7/9

* assess the performance of new breeding lines in local environments (compared to controls) - 8/9

* distribute (or sell) new improved cultivars – 8/9

Actions in the last 2 years



- Reduction in breeding critical mass.
- Included some new trait targets.
- Using new technology to breed for divergent targets – breeding smarter.
- Restructure of the breeding programs for a more international focus.
- Become leaner and meaner.
- Marginal move away from a Multi-nationals breeding focus
- Addressing some quarantine issues.



Thanks and
Good Luck